Advanced® Osmometer Model 3250
Advanced® Cryoscope Model 4250

Service Manual

ADVANCED INSTRUMENTS, INC.
Model 3250 Osmometer
FEED
SETUP
TEST
CALIB
CLEAR
ENTER
START
STOP

ADVANCED INSTRUMENTS, INC.
Model 4250 Cryoscope
FEED
SETUP
TEST
CALIB
CLEAR
ENTER
START
STOP

ADVANCED INSTRUMENTS, INC.

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1. Introduction

Model 3250 Osmometer Specifications

Applies to Serial Suffix A - C. Refer to Design Changes for more information.

Electrical:

Voltage: 100 to 130 VAC (1.2 A) or 200 to 250 VAC (0.6 A)

Frequency: 50 or 60 Hz

Fuses: 2-Amp time delay for 100-130 VAC; 1-Amp time delay for 200-250 VAC

Power: 150 Watts

Memory Backup: integral lithium cell; 10 years min. (not user-replaceable)

Sample Volume: 0.2 or .25 mL

Sample Capacity: single sample

Readout: 20-character digital display

Units: mOsm/Kg H_2O

Range:

Low: 0 to 2000 mOsm/Kg H_2O

High: 1400 to 4000 mOsm/Kg H_2O

Resolution: 1 mOsm/Kg H_2O

Communications:

RS-232C and barcode scanner ports

Performance at Reference Conditions[1]

Linearity: Less than ±0.5% from a straight line

Repeatability:

0 to 400 mOsm ±2 mOsm/Kg (1 S.D.)
400 to 4000 mOsm ±0.5% (1 S.D.)

Drift: Less than 1 mOsm/Kg H_2O per month

Performance Over Operating Conditions

Temperature Effects: Less than 1 mOsm/Kg H_2O for every 5°C (9°F) ambient temperature change.

Operating Conditions

Temperature: 18°C to 35°C (64°F to 95°F)

Room Humidity: 5 to 80% relative humidity; (non-condensing)

Storage Temperature: -40°C to +45°C (-40°F to +113°F)

Start-up Time: From stand-by: immediately
From power on: under 5 minutes

Test Time: Approximately 2 minutes per sample in 0 to 2000 mOsm range; moderately longer in high range.

Dimensions	inches	centimeters
Width:	13	32
Depth:	18	46
Height:	16	41

Weight	pounds	kilograms
Net:	28	13
Shipping:	39	19

Warranty: One-year limited warranty on workmanship and all parts except glass, plastic and parts warranted by their makers.

Certification: c ETL us LISTED Intertek 98214 CE

Refer to Regulatory Notices (see page 14) for applicable standards.

Installation Class:	I
Over-Voltage Category:	II
Pollution Degree:	2
Moisture Protection:	IPX0 (Ordinary)

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[1] Reference Conditions: 20 to 25°C (68 to 77°F); 40 to 60% Relative Humidity; tolerances of reference or calibration solutions excluded.

Model 3250 Osmometer Specifications

Applies to Serial Suffix D and Higher. Refer to Design Changes for more information.

Electrical:

Voltage: 100 to 250 VAC (0.6 A)

Frequency: 50 or 60 Hz

Fuses: 2-Amp time delay (Type T)

Power: 95 Watts

Memory Backup: integral lithium cell; 10 years min. (not user-replaceable)

Sample Volume: 0.2 or .25 mL

Sample Capacity: single sample

Readout: 20-character digital display

Units: mOsm/Kg H_2O

Range:

Low: 0 to 2000 mOsm/Kg H_2O
High: 1400 to 4000 mOsm/Kg H_2O

Resolution: 1 mOsm/Kg H_2O

Communications:

RS-232C and barcode scanner ports

Performance at Reference Conditions[1]

Linearity: Less than ±0.5% from a straight line

Repeatability:

0 to 400 mOsm: Std. Deviation $\leq$ 2 mOsm/Kg H_2O
400 to 4000 mOsm: Std. Deviation $\leq$ 0.5% of value mOsm/Kg H_2O

Drift: Less than 1 mOsm/Kg H_2O per month

Performance Over Operating Conditions

Temperature Effects: Less than 1 mOsm/Kg H_2O for every 5°C (9°F) ambient temperature change.

Operating Conditions

Temperature: 18°C to 35°C (64°F to 95°F)

Room Humidity: 5 to 80% relative humidity; (non-condensing)

Storage Temperature: -40°C to +45°C (-40°F to +113°F)

Start-up Time: From stand-by: immediately
From power on: under 5 minutes

Test Time: Approximately 2 minutes per sample in 0 to 2000 mOsm range; moderately longer in high range.

Dimensions	inches	centimeters
Width:	13	32
Depth:	18	46
Height:	16	41

Weight	pounds	kilograms
Net:	23	10
Shipping:	34	15

Warranty: One-year limited warranty on workmanship and all parts except glass, plastic and parts warranted by their makers.

Certification:

Refer to Regulatory Notices (see page 14) for applicable standards.

Installation Class:	I
Over-Voltage Category:	II
Pollution Degree:	2
Moisture Protection:	IPX0 (Ordinary)

---

[1] Reference Conditions: 20 to 25°C (68 to 77°F); 40 to 60% Relative Humidity; tolerances of reference or calibration solutions excluded.

Model 4250 Cryoscope Specifications

Applies to Serial Suffix A - C. Refer to Design Changes for more information.

Electrical:

Voltage: 100 to 130 VAC (1.2 A) or 200 to 250 VAC (0.6 A)

Frequency: 50 or 60 Hz

Fuses: 250V time delay (Type T):
2-Amp time delay for 100-130 VAC;
1-Amp time delay for 200-250 VAC

Power: 150 Watts

Memory Backup: integral lithium cell; 10-year life (typical); (not user-replaceable)

Sample Volume: 2.0 to 2.5 mL

Sample Capacity: single sample

Readout: 20-character vacuum fluorescent display

Units: mºC or mºH

Range: 0 to 1000 mºC or mºH

Resolution: 1 mºC or mºH

Communications: On-board printer, DTE EIA-232/V.24 (RS-232) serial port and optional barcode scanner

Performance at Reference Conditions[1]

Linearity: Less than ±0.5% from a straight line

Repeatability:
± 2 mºC or mºH (1 S.D.) between 0 and -400 mºC
± 0.5% (1 S.D.) between -400 and -1000 mºC

Drift: Less than 1 unit per month

Performance Over Operating Conditions

Temperature Effects: Less than 1 unit for every 5°C (9°F) ambient temperature change.

Operating Conditions

Temperature: 18°C to 35°C (64°F to 95°F)

Room Humidity: 5 to 80% relative humidity; (non-condensing)

Storage Temperature: -40°C to +45°C (-40°F to +113°F)

Start-up Time: From stand-by: immediately
From power on: under 5 minutes

Test Time: Approximately 90 seconds in 30-second timed mode.

Dimensions	inches	centimeters
Width:	13.0	33.0
Depth:	18.0	45.7
Height:	12.0	30.5
with Head Up:	16.0	40.6

Weight	pounds	kilograms
Net:	28.0	12.7
Shipping:	39.0	17.7

Warranty: One-year limited warranty on workmanship and all parts except glass, plastic and parts warranted by their makers.

Certification: Intertek 98214 CE

Refer to Regulatory Notices (see page 14) for applicable standards.

Installation Class: I

Over-Voltage Category: II

Pollution Degree: 2

Moisture Protection: IPX0 (ordinary)

Model 4250 Cryoscope Specifications

Applies to Serial Suffix D and Higher. Refer to Design Changes for more information.

Electrical:

Voltage: 100 to 250 VAC (0.6 A)

Frequency: 50 or 60 Hz

Fuses: 2-Amp time delay (Type T)

Power: 95 Watts

Memory Backup: integral lithium cell; 10-year life (typical); (not user-replaceable)

Sample Volume: 2.0 to 2.5 mL

Sample Capacity: single sample

Readout: 20-character vacuum fluorescent display

Units: mºC or mºH

Range: 0 to 1000 mºC or mºH

Resolution: 1 mºC or mºH

Communications: On-board printer, DTE EIA-232/V.24 (RS-232) serial port and optional barcode scanner

Performance at Reference Conditions[1]

Linearity: Less than ±0.5% from a straight line

Repeatability:
0 to -400 mºC: Std. Deviation ≤ 2 mºC or mºH
-400 to -1000 mºC: Std. Deviation ≤ 0.5% of value mºC or mºH

Drift: Less than 1 unit per month

Performance Over Operating Conditions

Temperature Effects: Less than 1 unit for every 5°C (9°F) ambient temperature change.

Operating Conditions

Temperature: 18°C to 35°C (64°F to 95°F)

Room Humidity: 5 to 80% relative humidity; (non-condensing)

Storage Temperature: -40°C to +45°C (-40°F to +113°F)

Start-up Time: From stand-by: immediately
From power on: under 5 minutes

Test Time: Approximately 90 seconds in 30-second timed mode.

Dimensions	inches	centimeters
Width:	13.0	33.0
Depth:	18.0	45.7
Height:	12.0	30.5
with Head Up:	16.0	40.6

Weight	pounds	kilograms
Net:	23	10
Shipping:	34	15

Warranty: One-year limited warranty on workmanship and all parts except glass, plastic and parts warranted by their makers.

Certification: Intertek 98214

Refer to Regulatory Notices (see page 14) for applicable standards.

Installation Class:	I
Over-Voltage Category:	II
Pollution Degree:	2
Moisture Protection:	IPX0 (ordinary)

General Description and Purpose

Advanced® Osmometers and Cryoscopes determine the concentration of solutions through freezing-point depression measurement. Osmometers are used primarily to measure body fluids such as serum and urine, and cryoscopes are used to determine the freezing points of various liquids and to detect added water in milk. Application information is available upon request.

Except for different cooling assemblies, stir/freeze wires, sample sizes and software, the 3250 and the 4250 are identical to one another. For clarity when replacing parts or troubleshooting, the instructions indicate any significant differences between the two instruments.

The Service Manual

This Service Manual contains:

- instructions for performing repairs.
- guides for troubleshooting operational and mechanical problems.
- circuit system illustrations.
- information about replacement parts and service repairs.

⚠ This manual is designed to assist service technicians, and does not imply a license to perform repairs without proper qualifications.

Service Assistance

To contact Advanced Instruments Product Service:

- Call (800) 225-4034 (toll-free within the USA and Canada; after normal business hours, dial extension 2191)
- Call +US (781) 320-9000 (elsewhere)
- Or fax (781) 320-3669

When calling Advanced Instruments, have the model and serial number from the label on the back of the instrument, and a description of the problem. Use a telephone as close to the instrument as possible in order to facilitate making recommended diagnostic checks.

A service technician may assist in making minor repairs over the phone, providing you with recommended parts (or part numbers), or may issue an authorization (RMA) to ship the instrument for factory repair.

The RMA procedure is as follows:

1. Contact Advanced Instruments to obtain an RMA.
2. Pack and ship the instrument in its original carton. Do not send instrument supply items.
3. Prepay shipment to the factory. Advanced Instruments cannot accept collect shipments. Insure the shipment or accept the damage risk.

Safety / Regulatory Information

⚠ To reduce the risk of bodily injury, electric shock, fire, and damage to your instrument, please read and observe the following precautions.

- If the product is used in a manner not in accordance with the equipment design, operating instructions or manufacturer's recommendations, the operation of the product may be impaired to the extent that a safety hazard is created.
- Do not attempt to perform electrical work if you are not fully qualified. This manual is not a substitute for electrical training.

Symbol Conventions

⚠ The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying this product.

⚡ The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated dangerous voltage within the product's enclosure that may be of sufficient magnitude to constitute risk of electric shock to persons.

The static symbol within an equilateral triangle is intended to alert the user to the presence of internal components that could be damaged by static electricity.

This static symbol is intended to alert the user to the presence of a specific component that could be damaged by static electricity.

~ This symbol indicates the presence of alternating current (AC).

⏛ This symbol indicates the presence of a fuse.

⏚ This symbol indicates the presence of protective earth ground.

| This symbol indicates the power is ON.

○ This symbol indicates the power is OFF.

NOTE Additional symbol definitions are available in the Symbols section.

General Cautions

- This product should be operated only with the type of power source indicated on the product's electrical ratings label. Refer to the installation instructions included with the product.
- If the power cord provided is replaced for any reason or if an alternate cord is used, the cord must be approved for use in the local country. The power cord must be approved for the product's listed operating voltage and be rated at least 20% greater than the ampere ratings marked on the product's electrical ratings label. The cord end that connects to the product must have an IEC 60320 connector.
- Plug the product into an approved grounded electrical outlet.
- Do not disable the power cord's grounding plug.
- If an extension cord or power strip is used, make sure that the cord or strip is rated for the product, and that the total ampere ratings of all products plugged into the extension cord or strip do not exceed 80% of the cord's or strip's rating limit.

- Route power cords so that they will not be walked on, tripped on, or pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cord exits the product.
- Do not pull on cords and cables. When unplugging cords or cables, grasp the corresponding connector.
- Do not install or use this product in any area subject to extreme short-term temperature variations, or locations that exceed the specified operating environment temperatures.
- Never use this product in a wet area.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.
- Do not install or use the product on an unstable, non-level work surface.
- Do not operate this product with the covers removed or unsecured.

Service & Maintenance Cautions

- Unplug the power cord prior to opening or removing covers, or else you may be exposed to electric shock, excessive temperatures, or mechanical hazards.
- Performing service or maintenance not detailed in the User's Guide, with or without this Service Manual, should only be done by a qualified service technician.
- Never restrict airflow into or out of the product. Occasionally, check the air vents for blockage.
- Wipe the exterior of the product with a soft, damp cloth as needed. Using cleaning products other than those specified, may discolor or damage the finish.
- If the product requires service for any of the following reasons, unplug the product from the electrical outlet and refer service to a qualified service technician.
  - The power cord, extension cord, power strip or power input module is damaged.
  - Liquid has been spilled into the interior of the product.
  - A foreign object has fallen into the product.
  - The product has been dropped or damaged by a falling object.
  - There are noticeable signs of overheating or a burning odor.
  - The product does not operate normally when you follow the operating procedures.
  - The main supply fuse(s) or any internal fuse(s) continually fail.
- A discharge of static electricity from contact with the human body or other conductor may damage system boards or static sensitive devices. Never perform internal maintenance without following recommended static protection procedures.
- The product is equipped with operator accessible fuses. If a fuse blows, it may be due to a power surge or failure of a component. Replace the fuse only once. If the fuse blows a second time, it is probably caused by failure of a component part. If this occurs, refer service to qualified service personnel. Always replace the fuse with one of the same rating, voltage, and type. Never replace the fuse with one of a higher current rating.
- When servicing the product, use only factory-specified parts.
- WARNING: When returning this product for service, or shipping this product to a second location, remove all hazardous specimens and decontaminate the product before packaging for shipment. If the product cannot be decontaminated, consult with your shipping agent on appropriate packaging and marking.

⚠ Hazardous Material Cautions

- **WARNING**: Handle all biohazardous materials according to established good laboratory practices and follow your institution's exposure control plan. Persons handling human blood and body fluid samples must be trained in blood-borne hazards and observe universal precautions. Universal precautions is an approach to infection control, where all human blood and body fluids are treated as if known to be infectious. Use personal protective equipment such as gloves, gowns, etc., to prevent exposure. Store biohazardous materials in regulated waste containers and dispose of these materials in a safe and acceptable manner that is in compliance with all country, state and local requirements.
- If a biohazardous material is spilled on or inside the equipment, decontaminate the equipment using a 1% bleach solution, or as outlined by those policies and procedures established within your institution.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Regulatory Notices

- This product has been designed and manufactured in accordance with U.S., Canadian, and European regulatory requirements as outlined below. Modifications made to this product that are not expressly approved in writing by the manufacturer will void the user's authority to operate this product, previously issued factory approvals, and the user's rights under the warranty.
- The distributor or dealer may have applied additional local, national, or international approvals to this product. Consult the distributor or dealer for more information and documentation.
- Connections to this product must be made with shielded cables. Use of non-shielded cables may violate RFI/EMI limits.

Symbol Conventions

CE This symbol indicates conformity to relevant European directives.

C ETL LISTED US Intertek 98214 This symbol indicates the product was tested to conform to relevant Canadian and U.S. safety standards by Intertek Testing Services NA, Inc. The ETL mark is approved in the United States as a Nationally Recognized Testing Lab (NRTL) by OSHA, and in Canada by the Standards Council of Canada.

IVD *In Vitro* Diagnostic Medical Device complying with EU Directive 98/79/EC.

Pb This symbol, depending upon its location, indicates the assembly, component, and/or product are free of lead. In respect to its inclusion on a circuit component or assembly, the following must be adhered to when servicing. Failure to do so may result in defects caused by dissimilar metals.

1. Do not repair or modify using a lead-containing solder.
2. Do not repair or modify using any soldering tools that have been in contact with lead-containing solders.
3. Do not repair or modify with any lead-free solder other than that specified by the manufacturer or as indicated by the symbology of standard IPC-1066.
4. Do not repair or modify using any soldering tools that have been in contact with any other incompatible lead-free solders.
5. Contact factory service for further information.

e2

e2

EXAMPLES ONLY

The number in this symbol indicates the type of lead-free solder used in the assembly of printed circuit boards, per standard IPC-1066. Repair or modification must be performed using the same or compatible type lead-free solder and matching tools. Failure to do so may result in defects caused by dissimilar metals.

Contact factory service for further information.

FCC Requirements

- **WARNING**: Changes or modifications to this unit not expressly approved by Advanced Instruments could void the user's authority to operate the equipment.
- This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Re-orient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio TV technician for help.

Regulatory Approval Type	Description	
	Applies to Serial Suffix A - C	Applies to Serial Suffix D and Higher
U.S. Safety	This product has been listed by ETL testing laboratories as being in compliance with the requirements of UL 61010A-1, 1st Edition, "Electrical Equipment for Laboratory Use; Part 1: General Requirements". The "US" in the lower right of the ETL mark demonstrates this listing.	This product has been listed by ETL testing laboratories as being in compliance with the requirements of UL 61010-1, "Electrical Equipment for Laboratory Use; Part 1: General Requirements". The "US" in the lower right of the ETL mark demonstrates this listing.
Canadian Safety	This product has been listed by ETL testing laboratories as being in compliance with the requirements of CAN/CSA C22.2 No.1010.1-92, "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements"; Including Amendment Two. The "C" in the lower left of the ETL mark demonstrates this listing.	This product has been listed by ETL testing laboratories as being in compliance with the requirements of CAN/CSA C22.2 No.61010.1, "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements"; Including Amendment Two. The "C" in the lower left of the ETL mark demonstrates this listing.
CE Declaration of Conformity - EMC	This product meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated using the following standards, as listed in the Official Journal of the European Communities: Consult the Declaration of Conformance certificate shipped with the product for the latest update. • EN 61326: 1997 with A1 & A2, Group 1, Class B, "Electrical Equipment for Measurement, Control, and Laboratory Use"	This product meets the intent of Directive 2004/108/EC Conformity - EMC for Electromagnetic Compatibility. Compliance was demonstrated using the following standards, as listed in the Official Journal of the European Communities: Consult the Declaration of Conformance certificate shipped with the product for the latest update. • EN 61326-1:2006 & EN 55011:1998, Group 1, Class B, "Electrical Equipment for Measurement, Control, and Laboratory Use"
CE Declaration of Conformity - IVD (3250 only)	This product meets the intent of Directive 98/79/EC for In Vitro Diagnostic Medical Devices. Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update.	This product meets the intent of Directive 98/79/EC for In Vitro Diagnostic Medical Devices. Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update.
CE Declaration of Conformity - WEEE	This product meets the intent of Directive 2002/96/EC as amended by 2003/108/EC for Waste Electrical and Electronic Equipment (WEEE). Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update.	This product meets the intent of Directive 2002/96/EC as amended by 2003/108/EC for Waste Electrical and Electronic Equipment (WEEE). Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update.
CE Declaration of Conformity - Low Voltage	This product meets the intent of Directive 73/23/EEC, the Low Voltage Directive. Compliance was demonstrated using the following standards, as listed in the Official Journal of the European Communities: Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update. • EN 61010-1 (2001), “Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements”.	This product meets the intent of Directive 2006/95/EC, the Low Voltage Directive. Compliance was demonstrated using the following standards, as listed in the Official Journal of the European Communities: Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update. • EN 61010-1, “Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements”.
(3250 only)	• EN 61010-2-101: 2002, “Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-101: Particular Requirements for In Vitro Diagnostic (IVD) Medical Equipment”.	• EN 61010-2-101, “Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-101: Particular Requirements for In Vitro Diagnostic (IVD) Medical Equipment”.

Regulatory Approval Type	Description	
	Applies to Serial Suffix A - C	Applies to Serial Suffix D and Higher
FCC - Part 15 Subpart B, Class B	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Canadian ICES-003	This Class B digital apparatus complies with Canadian ICES-003 *Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.*	This Class B digital apparatus complies with Canadian ICES-003 *Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.*
CB Report CB Certificate	-------------------------------	A CB report and certificate have been issued for this product. The standard used was IEC 61010-1.
U.S. FDA Listing (3250 only)	The osmometer, along with the calibrators and controls manufactured by Advanced Instruments, are listed with a U.S. Department of Health and Human Services, Food and Drug Administration, as: Osmometer Class 1 Calibrators Class 2 Controls Class 1	The osmometer, along with the calibrators and controls manufactured by Advanced Instruments, are listed with a U.S. Department of Health and Human Services, Food and Drug Administration, as: Osmometer Class 1 Calibrators Class 2 Controls Class 1
Health Canada License (3250 only)	The osmometer, along with the calibrators and controls manufactured by Advanced Instruments, are licensed with Health Canada, Therapeutic Products Directorate, Medical Devices Bureau, as: Osmometer Class 2 Calibrators Class 2 Controls Class 2	The osmometer, along with the calibrators and controls manufactured by Advanced Instruments, are licensed with Health Canada, Therapeutic Products Directorate, Medical Devices Bureau, as: Osmometer Class 2 Calibrators Class 2 Controls Class 2
CE Declaration of Conformity - RoHS	This product meets the intent of Directive 2002/95/EC for the Restriction of Use of Certain Hazardous Substances in Electrical and Electronic Equipment" as an exempt medical device per Article 2, Paragraph 1 and per Annex 1, Category 8 and/or 9 of Directive 2002/96/EC.	This product meets the intent of Directive 2002/95/EC for the Restriction of Use of Certain Hazardous Substances in Electrical and Electronic Equipment" as an exempt medical device per Article 2, Paragraph 1 and per Annex 1, Category 8 and/or 9 of Directive 2002/96/EC.

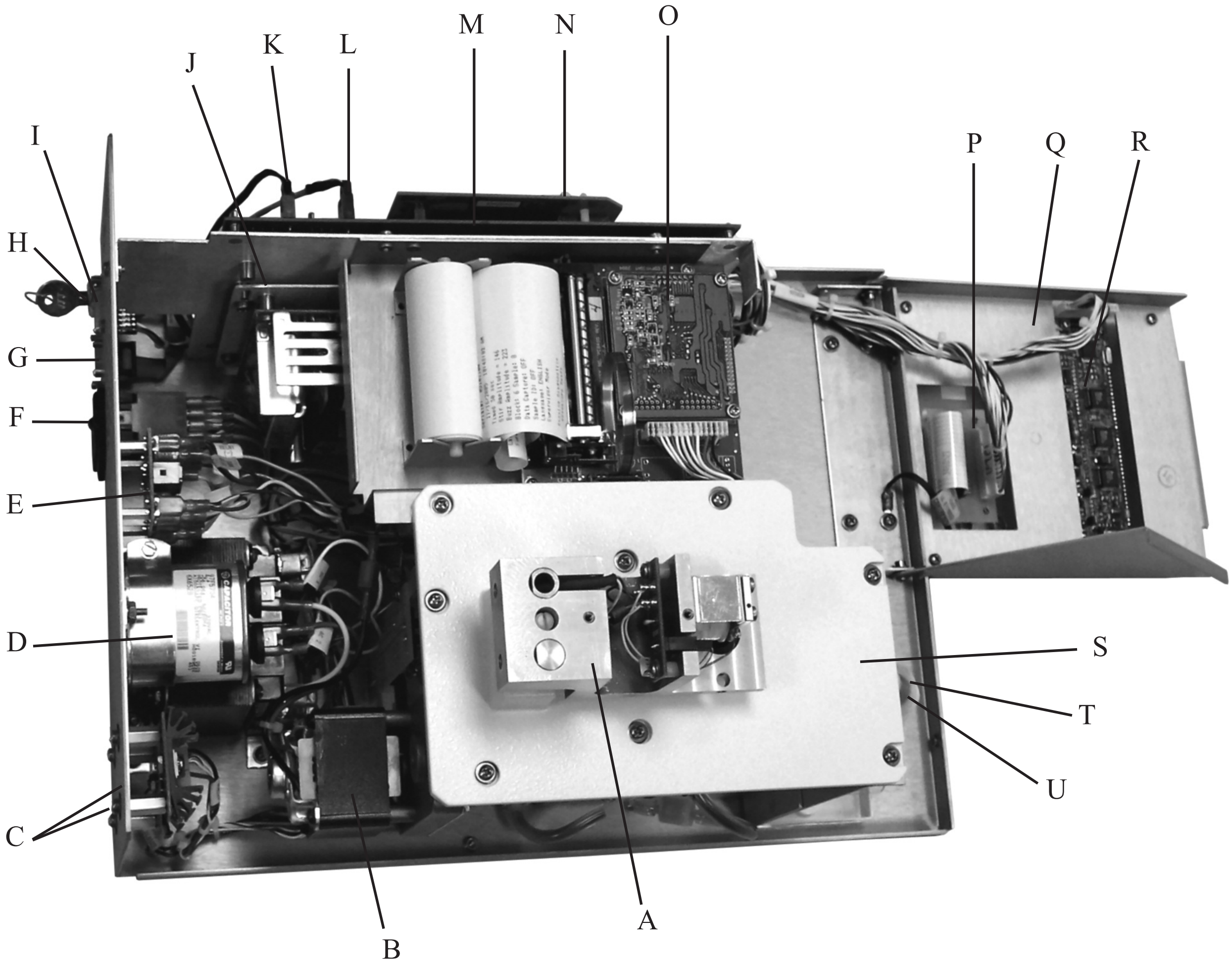
Notes:

2. General Overview

General Overview

(Intel Processor Systems)

Serial Suffix A - C

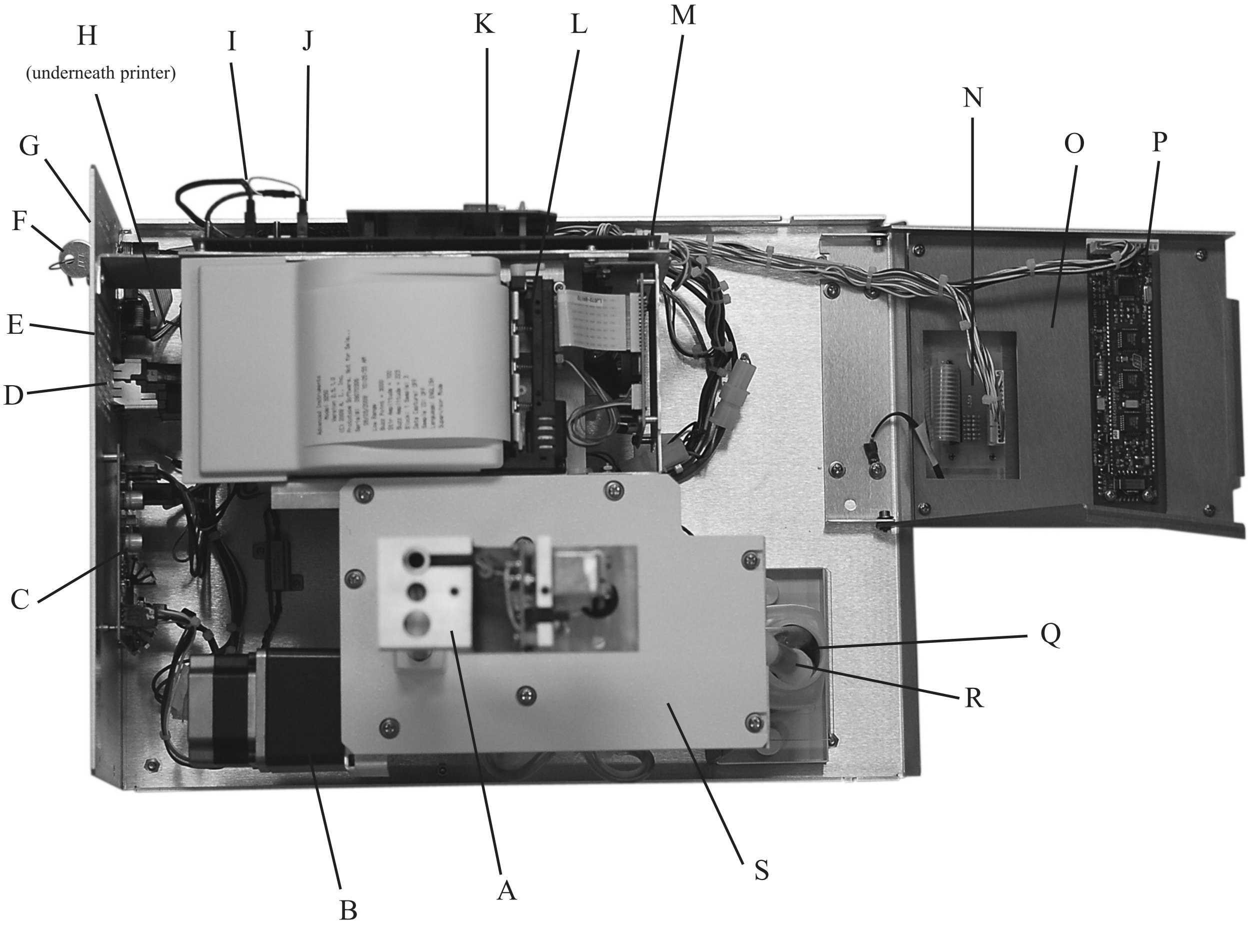


A. Head
B. Motor
C. Driver Transistors (Stir, Thermoelectric)
D. Motor Capacitor
E. Head Up/Head Down Relays
F. Power Entry Module
G. RS-232C Port
H. Supervisor/Operator Keyswitch
I. Barcode Port
J. Power Supply
K. Sample Probe Plugin
L. Block Probe Plugin
M. Main Board Set, Application PCB
N. Main Board Set, Processor PCB
O. Printer
P. Keypad Transition Board
Q. Keypad
R. Display
S. Deck
T. Heat Transfer Return Tube
U. Heat Transfer Inlet Tube

General Overview

(Intel Processor Systems)

Serial Suffix D and Higher



- A. Head
- B. Motor
- C. Driver PCB
- D. Power Entry Module
- E. RS-232C Port
- F. Supervisor/Operator Keyswitch
- G. Barcode Port
- H. Power Supply (underneath printer)
- I. Sample Probe Plugin
- J. Block Probe Plugin
- K. Main Board Set, Processor PCB
- L. Printer
- M. Main Board Set, Application PCB
- N. Keypad Transition Board
- O. Keypad
- P. Display
- Q. Heat Transfer Return Tube
- R. Heat Transfer Inlet Tube
- S. Deck

Calibration

The 3250 has two ranges, each with its own calibration. To calibrate the low range, three freezing-point tests are required at the 100 mOsm/kg level, and six tests are required at the 1500 mOsm/kg level. To calibrate the high range, six freezing-point tests are required at both the 1500 mOsm/kg level and the 3000 mOsm/kg level.

The 4250 allows timed or plateau-seeking calibration in either the Hortvet (m°H) or the Celsius (m°C) scale. Six freezing-point tests are required at each of the 4250's two calibration levels:

-408 m°C (-422 m°H), and
-600 m°C (-621 m°H).

Note: *If you see the message "Recalibration Needed", follow the instrument prompts to complete the initial calibration. Your calibration may vary slightly from that mentioned here.*

Refer to the instrument User's Guide for additional information on calibration.

Calibrate the instrument according to the instructions below:

1. Turn the instrument on.

2. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position. It must remain there throughout calibration.

3. Press **CALIB** to begin the calibration sequence.

4. The display will prompt you at each calibration level. Place a sample of the first calibration standard into the freezing chamber and press **START**.

5. Continue loading and testing samples at the first calibration level until the display prompts you for samples at the second calibration level.

6. Place the sample of the second calibration standard into the freezing chamber and press **START**.

7. When the instrument has completed calibration, the display will read "**Calibration Complete**".

3250/4250 Circuit Description

The instrument is comprised of the following functional blocks:

Power Supply
Serial Suffix A - C

The power entry assembly interfaces the AC voltage presented to the instrument with the transformer. The transformer provides 120 VAC to the power supply board and the head motor. The power supply provides the power to run the main printed circuit board (±12 VDC, ±5 VDC), the thermoelectrics (5 VDC), the fan (12 VDC), the stir/freeze coil (12 VDC), and the internal printer (5 VDC).

Note: *The internal printer may be powered by +5 VDC (red/orange wire) or +12 VDC (violet wire). Consult system schematics for proper service.*

Power Supply
Serial Suffix D and Higher

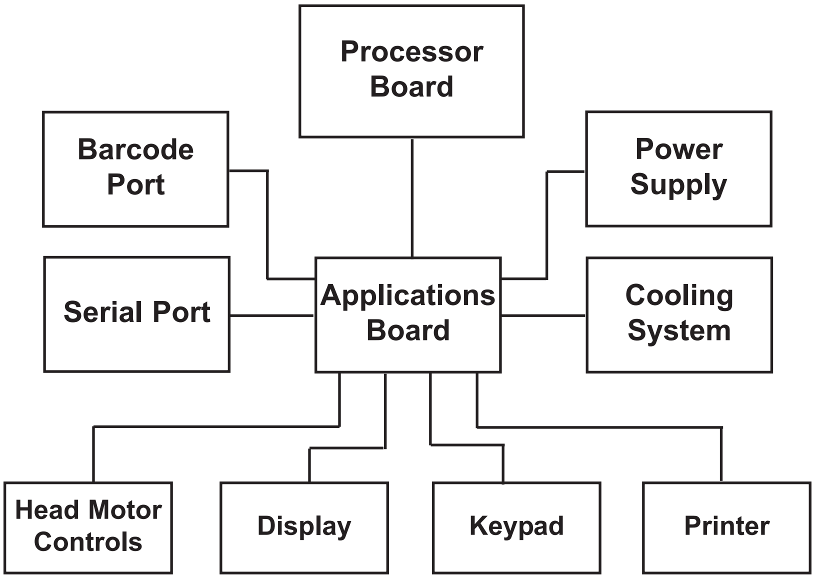
The power entry assembly interfaces the AC voltage presented to the instrument with the AC/DC switching power supply. The power supply provides the power to run the main printed circuit board set (±12 VDC, +5 VDC), the thermoelectrics (5 VDC), the fan (12 VDC), the stir/freeze coil (12 VDC), the internal printer (12 VDC), and the motor and control circuits (+24 V).

Front End

The sample thermistor measures the temperature of the sample. The thermoelectrics (whose duty cycle is controlled through the block probe/thermistor) supercool the sample. The stir/freeze wire constantly stirs the sample to guarantee uniform cooling. When the supercooled sample reaches a set temperature (3000 mOsm for the low range and 4800 mOsm for the high range, by default, in the 3250, and 3000 mºC in the 4250), the stir/freeze wire "buzzes" causing the sample to freeze. During a test, the fan duty cycle tracks the thermoelectrics duty cycle -10%. If duty cycle drops below 20%, the fan is off. In between tests, the fan runs as required to maintain the software controlled target temperatures.

325605 Control Board Set Description

General: The control board set is made up of two printed circuit boards in a motherboard/daughterboard configuration.



325620/425620/325621/425621
Processor Board

Processor: The processor used is an Intel 80C186 16-bit embedded processor. The 80C186 contains three programmable 16-bit timers, two serial ports, programmable interrupts, 1 mega-byte of memory address space, and 64 kilo-bytes of input/output (I/O) address space. The processor uses an external 32 MHz crystal to generate the internal 16 MHz system clock. The processor controls access to all memory and all I/O.

Memory Map: The 1 mega-byte of memory address space contains read-only memory (Flash EPROM), read/write memory (static RAM), and the real time clock. About half of the address space is unused, allowing for future expansion. The read-only memory is divided into four sections: reset vector, boot code, parameter blocks (unused), and applicaiton code. The reset vector tells the processor where to first start executing code; in this case, the boot code is executed first after reset. The boot code determines if new software will be downloaded by checking if the dip switch is in the "PROGRAM" position. If it is, the boot code waits for new software to be downloaded through the serial port. If not, the application code starts.

The real time clock maintains the current date and time, and contains nonvolatile memory where the instrument's operation parameters are stored. A internal lithium battery preserves the contents of the nonvolatile memory when the instrument is turned off. Finally, the read-write memory is used for stacks, variables, etc., except for the small section allocated for the interrupt vectors. The interrupt vectors tell the processor what code to run when an interrupt occurs, and functions similarly to the reset vector.

Please note that all memory addresses and sizes are always defined in terms of bytes, even though the processor handles words (1 word = 2 bytes, 1 byte = 8 bits; therefore, 16 bits = 1 word).

Input/Output Map: The 64 kilo-bytes of I/O address space control access to all peripherals such as the serial ports, application board, etc. The processor uses 256 bytes, called the Peripheral Control Block, to control the integrated serial ports, timers, interrupts, chip selects, and I/O pins. The Peripheral Control Block is fully described in the 80C186EB/80C188EB Microprocessor User's Manual. The application board's registers and the CPU board's registers control access to various functions and are described later.

Memory: Two types of memory are available: read-only and read/write. The chips used here have 8-bit wide data buses. Used in pairs, the memory becomes compatible with the processor's 16-bit wide data bus. The read-only memory is implemented using two 128 kilo-bytes x 8 bits Flash EPROMs. Flash memory is only programmable when a programming voltage (in this case, 12 volts DC) is applied to the memory; otherwise, it behaves like read-only memory. The boot code controls the programming voltage, since this is the only place where new software can be downloaded. The read/write memory is implemented using two 128 kilo-bytes x 8 bits static RAMs.

Watchdog Timer: The watchdog timer provides a mechanism to reset the processor when the software is not behaving normally. The software "pets" the watchdog every 100 - 200 milliseconds. As long as the watchdog is "petted", nothing happens. However, if the software stops "petting" the watchdog, the watchdog "bites" the processor by activating the processor's RESET pin, causing the processor to reset. The watchdog will also reset the processor if the power supply falls below 4.75 VDC. These two features allow the instrument to recover from abnormal software and hardware conditions.

Real Time Clock (RTC): The real time clock maintains the current date and time. The RTC uses an internal clock circuit with an internal, 10-year life, lithium battery to perform timekeeping. The battery also preserves the contents of internal memory.

Dip Switch: The three-position or four-position dip switch allows the user to download new software via one switch. The other two switches are available for selecting different operating modes. These operating modes and the process for downloading software are described later in this manual.

Voltages: Three voltages are present on the CPU board: +5 VDC, +12 VDC, and V_{PP}. +5 VDC powers all the logic. +12 VDC is switched on and off to create the flash memory's programming voltage, V_{PP}.

Glue Logic: The glue logic performs the functions of creating the RAM memory chip selects, the Flash memory write signals, the V_{PP} control signal, the watchdog control signal, and accessing the dip switch. The CPU board has two software accessible hardware registers to read the dip switch and to control watchdog and V_{PP}.

Connectors: A 64-pin connector provides address, data and interrupt signals. A 16-pin connector provides general chip selects and serial receive/transmit signals. The application PCB uses a subset of the available signals.

PCB605 Application Board

The application PCB contains all circuitry specific to the instrument. The board includes voltage supplies, indicators, analog-to-digital converters, drive circuitry, parallel ports, serial ports, and various switches.

Analog-to-Digital Converters: Two analog-to-digital converters are provided; one for the sample thermistor probe, and one for the block thermistor probe. The thermistors vary in resistance from approximately 2 kilo-ohms at room temperature, to approximately 10 kilo-ohms at -12ºC. Typically, a 0.6 ohm change in the thermistor's resistance equates to a 1 mOsm/1.86mºC change. A separate Wheatstone bridge circuit is used to measure the voltage across each thermistor probe. This voltage is first filtered and then sampled by the analog-to-digital converter. The analog-to-digital converter uses a sigma-delta conversion technique with on-chip filtering and a 6.25 VDC reference voltage.

I/O Ports: Circuitry for the two serial ports (RS-232 and barcode) and the parallel printer is present on the application board, with cabling to the actual connectors on the back panel and the internal printer.

Display & Keypad: The display and keypad are interfaced to the processor via programmable logic devices (PLDs). The keypad is polled in a row/column process which identifies the key pressed to the microprocessor. The application logic, in response to processor commands, controls the LEDs located on the keypad.

Light Emitting Diodes (LED): LEDs are provided to indicate when a high current load is active, a sensor is tripped, or a voltage supply is active. Green LEDs are used on the power supply voltages, yellow LEDs are used on driver signals such as the fan and head motor controls, and red LEDs are used to indicate that the head up and down optical sensors have been tripped.

Application Logic: The application logic is made up mainly of two programmable logic devices (PLDs). These provide software accessible hardware registers, enabling the software to read the keypad, sensors, and analog-to-digital converters. These also allow manipulation of the display, external components such as the fan, head motor, etc., and interface to the RS-232 ports. The printer is controlled directly from the microprocessor through an 8-pin D-latch.

Connectors: Connectors are supplied for the CPU PCB, display, keypad, power, drives, probes, and back panel I/O ports.

Serial (RS-232) Port Interface: An RS-232 line driver/receiver provides the microprocessor with a serial port interface that supports both hardware and software handshaking.

The DB-9 RS-232 port conforms to the DTE RS-232C standard and has the following pin assignments:

Signal	**Pin**	**Direction**
Carrier Detect	1	to 3250
Receive Data	2	to 3250
Transmit Data	3	from 3250
Data Terminal Ready	4	from 3250
Signal Ground	5	common
Data Set Ready	6	to 3250
Request to Send	7	from 3250
Clear to Send	8	to 3250

Note that your instrument is only designed to support unidirectional communication with an external device. At this time, there is no protocol for bidirectional communication.

For a sample RS-232 Port Setup, please see the RS-232 Supplemental Information in the Appendix at the end of this user's guide.

Note: *This instrument requires the use of a null modem RS-232C cable. There are several variations on null modem cables. Advanced Instruments recommends that you purchase a RS-232C cable direct from our factory.*

Supervisor/Operator Keyswitch Interface: A PLD is used to interface the supervisor/ operator keyswitch to the microprocessor. In *Operator* position, the user cannot change setup or calibration settings.

Other Circuit Components

Drive Circuitry, Serial Suffix A - C: Drive circuitry is provided to turn on and off the four high current loads such as the stir wire, the head motor, the thermoelectric cooler, and the fan.

The stir wire coil is controlled by the rear panel-mounted darlington transistor (PCB522). The drive circuit consists of a programmable timer, D/A converter, and interface op-amps. The timer provides a square wave of approximately 71Hz, while the D/A converter controls the output amplitude to the darlington transistor.

The head motor is controlled by two relays located at the rear of the chassis that interface the 120 VAC motor to the DC logic. One relay raises the head, while the other relay lowers the head. The relays get their commands from the application board via two FETs and the application logic. LEDs are provided on the application board for monitoring the drive signals. LEDs are also provided to monitor the signals from the head sensor board, described below.

The thermoelectric cooler is controlled by the FET driver transistor mounted on the rear panel (PCB520). The FET is, in turn, controlled by the microprocessor through the PLD application logic. The processor varies the duty cycle square wave in response to software commands and block probe resistance.

Drive Circuitry, Serial Suffix D and Higher: Drive circuitry is provided to turn on and off four system loads such as the stir wire, the head motor, the thermoelectric cooler, and the fan.

The stir wire coil drive circuit consists of a programmable timer, D/A converter, and interface op-amps on the application board (PCB605). The timer provides a square wave of approximately 71 Hz, while the D/A converter controls the output amplitude to the darlington transistor mounted on the driver board (PCB523).

The thermoelectric cooler is controlled by the microprocessor through the PLD application logic. The processor varies the duty cycle square wave in response to software commands and block probe resistance. These signals are provided to the FET driver transistor mounted on the driver board (PCB523).

The head motor is controlled by the application board via two FETs and the PLD logic. LEDs are provided on the application board for monitoring the drive signals. LEDs are also provided to monitor the signals from the head sensor board, described below. Two active low head up/head down signals are sent to the driver board (PCB523) where they are converted into acceleration, direction, and step commands for the motor drive chip. The motor drive chip translates these commands into current controlled outputs that move the DC stepper motor and provide idle torque when no movement is required. The following adjustments may be available for the motor circuit: R10 and TP16 are used to set the initial acceleration to a rise time of 4uS. R21 and TP15 are used to set the run frequency to 8 Khz.

The fan is controlled by a FET transistor on the application board, that is interfaced to the processor through the application logic.

Head Transition Board (M20450) Description: The stir/freeze coil and the sample probe are connected to the head transition board which allows easy sample probe replacement.

Head Sensor Board (3D3380) Description:

This board provides two optical sensors that interface to a PLD on the main board. These two sensors detect the head-up and head-down conditions.

Keypad Transition Board (FLO520) Description: This board provides the interface to the keypad along with pull-up resistors for the keypad LEDs.

Barcode Port: A D-type, 15-pin barcode port is provided in the back of the instrument for connecting and providing power to such a device. For proper operation, the barcode port requires a 1200 bps, RS-232 signal providing asynchronous serial data containing 1 start bit, 8 data bits, 1 stop bit, and no parity.

Signal	Pin	Direction
+5V DC	1	to reader
receive data	10	from reader
gnd/earth	9	common

Barcode Port Connections

A suitable barcode scanner is available from Advanced Instruments. To interface with the instrument, the barcode scanner must be programmed as follows, referring to the scanner users guide.

1200 bps
CR suffix
disable beep after good decode
triggerless trigger mode (optional)

Internal Printer, Serial Suffix A - C: The internal printer assembly (325400) consists of the sheet metal mounting bracket, thermal print head (FL0403), thermal printer PCB (FL0402), and thermal printer PC board assembly (PCB400). All of this is connected to the application board (PCB605) via cable (M20465).

Note: *The internal printer may be powered by +5 VDC (red/orange wire) or +12 VDC (violet wire). Consult system schematics for proper service.*

Internal Printer, Serial D and Higher: The internal printer assembly (325420) consists of the sheet metal mounting bracket, thermal print head (325404), main control board (325421), printer interface board (PCB402), and the control cable (325419). All of this is connected to the application board (PCB605) via cable (325415), and on some models via cable (325033).

The printer interface board (PCB402) contains the power circuit converting +12 VDC into +5 VDC, a feed/self-test switch (S1), and some diagnostic LEDs. If the self-test switch is depressed as instrument power is applied, the printer will enter self-test mode and print out settings and a test character set. The LEDs indicate the operation of the paper-out detector (D1 yellow) and the door/platen-closed detector (D2 red). **POWER CONNECTION TO J1**

SHOULD NOT BE RECONNECTED WITH INSTRUMENT POWER ON, OR DAMAGE TO THE INSTRUMENT MAY RESULT.

The printer control board (325421) translates the data from the application board (PDCB605) into control signals for the print head thermal elements and drive motor (325404). This board also contains a factory-set configuration DIP switch (DS1) and jumper (JP1).

On models equipped with cable (325033), a compatible version of main board set (325605) and a properly configured printer interface board (PCB402), diagnostic LEDs, and a test switch are available in the lower right corner of the larger board (PCB605). D19 is a red LED that will indicate the printer door/platen interface is not closed or, if blinking, one of several printer errors have occurred, requiring factory assistance. D20 is a yellow LED that will indicate the paper is out or not detected when the door is closed. SW1 is a momentary switch that will cause the paper to advance when pressed or, if held down while main power is switched on, will place the printer into self-test mode.

Design Changes

The serial number suffix (referred to in this manual simply as the *suffix*) indicates the revision of the instrument. The chart below lists the major changes made at each revision of the 3250 Osmometer and 4250 Cryoscope.

Model 3250 Osmometer	Description
Serial Suffix 'A' January 2004	Original model released.
Serial Suffix 'B' May 2007	Base chassis and cover re-designed.
Serial Suffix 'C' October 2007	Up/Down relay PC boards re-designed into a single RoHS-compliant PC board.
Serial Suffix 'D' September 2009	**MAJOR REVISION** AC head motor and supporting components replaced with a DC stepper motor, multi-driver PC board and power supply, Seiko thermal printer assembly with thread-through paper loading and supporting components replaced with a Citizen thermal printer assembly with easy-load paper loading.
Serial Suffix 'E' October 2010	Application board redesigned to power display and keypad LEDs from VCC +5 VDC line. Main harness redesigned.

Model 4250 Cryoscope	Description
Serial Suffix 'A' November 2005	Original model released.
Serial Suffix 'B' May 2007	Base chassis and cover re-designed.
Serial Suffix 'C' October 2007	Up/Down relay PC boards re-designed into a single RoHS-compliant PC board.
Serial Suffix 'D' September 2009	**MAJOR REVISION** AC head motor and supporting components replaced with a DC stepper motor, multi-driver PC board and power supply, Seiko thermal printer assembly with thread-through paper loading and supporting components replaced with a Citizen thermal printer assembly with easy-load paper loading.
Serial Suffix 'E' October 2010	Application board redesigned to power display and keypad LEDs from VCC +5 VDC line. Main harness redesigned.

Replacement Parts

Serial Suffix D and higher has some different replacement parts from Serial Suffix A - C, although many parts have remained common. Before selecting a replacement part, check the serial suffix of the instrument on the serial suffix label on the rear of the instrument, then refer to the proper section. Refer to the Design Changes section for additional information.

3250

Common Parts

Block Probe	4D3340
Clapper	3C2241R
Control Board Set	325605R
Application Board (only)	PCB605R
Processor Board (only)	325621R
Cooling Assembly	3D3300R
Cooling Fan	4D3360
Cooling Well Inlet Check Valve	99133R
Firmware “FLASH” Update Kit	SFW008
Fluid Filter	4D3710R
Fuses: 2.0 Amp	70022
1.0 Amp	70011
Heat Transfer Fluid Intake Check Valve	4D3705R
Heat Transfer Fluid Pump Assembly	4D3690
Keypad	325511R
Load Resistor	425150R
Mandrel	3LH500
NVRAM Battery	71027R
Probe Alignment Tool Kit	3LA700
Sample Probe	3D3700
Stir/Freeze Coil	3D2404R
Stir/Freeze Wire	3LH243
Tube Ejector Spring	3D3312R
Yoke	3LH230R

Serial Suffix A - C Parts

Display Board	74051R
Head Up/Head down Relay	3D3109
Motor Assembly	4D3350R
Power Supply Assembly	4D3950
Printer Assembly without Power Harness	FL2401R
Printer Assembly with Power Harness	325400R
Stir Drive Transistor	PCB522R
Thermoelectric Drive Transistor	PCB520R

4250

Common Parts

Block Probe	4D3340
Clapper	3C2241R
Control Board Set	425605R
Application Board (only)	PCB605R
Processor Board (only)	425621R
Cooling Assembly	4D3300R
Cooling Fan	4D3360
Cooling Well Inlet Check Valve	99133R
Firmware “FLASH” Update Kit	SFW008
Fluid Filter	4D3710R
Fuses: 2.0 Amp	70022
1.0 Amp	70011
Heat Transfer Fluid Intake Check Valve	4D3705R
Heat Transfer Fluid Pump Assembly	4D3690
Keypad	325511R
Load Resistor	425150R
Mandrel	3LH500
NVRAM Battery	71027R
Probe Alignment Tool Kit	3LA700
Sample Probe	4D3102
Stir/Freeze Coil	3D2404R
Stir/Freeze Wire	4LH243
Tube Ejector Spring	4D3312
Yoke	3LH230R

Serial Suffix A - C Parts

Display Board	74051R
Head Up/Head Down Relay	3D3109
Motor Assembly	4D3350R
Power Supply Assembly	4D3950
Printer Assembly without Power Harness	FL2401R
Printer Assembly with Power Harness	325400R
Stir Drive Transistor	PCB522R
Thermoelectric Drive Transistor	PCB520R

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Serial Suffix D and Higher Parts

Display Board	702041R
Driver PCB	PCB523R
Motor Assembly	325304R
Power Supply Assembly	325950R
Thermal Printer Assembly	325420R
Thermal Printer Mechanism	325404R
Upgrade Kit, 3250/4250 Suffix D to E	325024

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Serial Suffix D and Higher Parts

Display Board	702041R
Driver PCB	PCB523R
Motor Assembly	325304R
Power Supply Assembly	325950R
Thermal Printer Assembly	325420R
Thermal Printer Mechanism	325404R
Upgrade Kit, 3250/4250 Suffix D to E	325024

Supplies & Accessories

3250

100 mOsm/kg Calibration Standard (10 5-mL ampules)	3LA011
500 mOsm/kg Calibration Standard (10 5-mL ampules)	3LA051
900 mOsm/kg Calibration Standard (10 5-mL ampules)	3LA091
1500 mOsm/kg Calibration Standard (10 5-mL ampules)	3LA151
2000 mOsm/kg Calibration Standard (10 5-mL ampules)	3LA201
3000 mOsm/kg Calibration Standard (10 5-mL ampules)	3LA301
100 mOsm/kg Calibration Standard (110-mL bottle)	3LA010
500 mOsm/kg Calibration Standard (110-mL bottle)	3LA050
900 mOsm/kg Calibration Standard (110-mL bottle)	3LA090
1500 mOsm/kg Calibration Standard (110-mL bottle)	3LA150
Clinitrol™ 290 Reference Solution (10 5-mL ampules)	3LA029
Osmolality Linearity Set (5 levels)	3LA028
Protinol® Near Serum Reference (3 levels)	3MA028
Renol™ Urine Osmolality Controls (2 levels)	3LA085
Air Filters, disposable	3D2340
Barcode Scanner	330016
Heat Transfer Fluid	3DA811
Power Cord (specify voltage and country)	----------
Printer Maintenance Kit	FL0425*
Printer Paper, pkg rolls	FLA835
Printer Paper Roll Holder	FL0408
Sample Tubes (0.2 mL, disposable)	3LA825
Sample Tube Rack	3LA846
Serial Port Computer Cable with DB9S	RS232-CABLE
Supervisor Keys	3D3185
Service Manual	3255SM
User's Guide	3255

4250

-422 m°H Calibration Standard (-408 m°C)	3LA023
-621 m°H Calibration Standard (-600 m°C)	3LA033
-530 m°H Lactrol® 530 Reference Solution (-512 m°C)	3LA030
Air Filters, Disposable	3D2340
Barcode Scanner	330016
Heat Transfer Fluid	3DA811
Power Cord (specify voltage and country)	----------
Printer Maintenance Kit	FL0425*
Printer Paper (5 rolls)	FLA835
Printer Paper Roll Holder	FL0408
Sample Tubes marked at 2-mL and 2.5-mL	3LA823
Sample Tube Rack	3LA846
Serial Port Computer Cable with DB9S	RS232-CABLE
Service Manual	3255SM
Supervisor Keys	3D3185
User's Guide	4255

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*Serial Suffix A - C, only.

How to order:

To order parts, supplies and accessories, contact the Advanced Instruments Customer Service.

- 800-225-4034 (toll-free within the USA and Canada)
- +US 781-320-9000 (elsewhere)
- +US 781-320-3669 (fax)

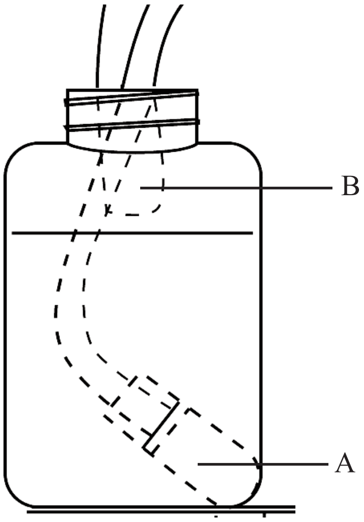
3. Maintenance

Cleaning and Maintenance

The cooling assembly should be cleaned once every two months to insure optimal performance.

To flush the system:

1. Open the door and remove the heat transfer fluid bottle.
2. Empty the contents and fill the bottle halfway with a solution of 1:5 bleach in distilled water.
3. Replace the bottle and insert only the tube with the filter (A). Completely immerse the filter in the fluid.
4. Insert the return tube (B) into another container.
5. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position.
6. Press **TEST** to enter the test menu. Press < or > to select "**Head Up Down Test**" and press **START**.



7. Insert an empty sample tube into the freezing chamber and press **START**.
8. Run this test for 10-15 minutes and then press **STOP**.

Note: *Using the manual primer pump to complement the head pumping action can help reduce the time required to flush the system.*

9. Remove the bottle with the diluted bleach and install a new bottle of heat transfer fluid. Insert only the tube with the filter (A).
10. Press **START** twice. Run this test until the colored fluid begins draining out of the return tube, and then press **STOP**.
11. Remove the return tube from the container and insert it into the heat transfer fluid bottle. Do not immerse the return tube in the heat transfer fluid (B).

12 Press **STOP** to exit the menu.

To drain the system:

1. Turn off the power and unplug the instrument. Remove the cover.
2. Remove the heat transfer fluid bottle and empty the contents.
3. Replace the empty bottle and insert the tubes.
4. Press gently on the pump at the bottom of the head. Slide until all liquid has been expelled (the unit may need to be tipped on its side to remove the liquid).

Removing the Head Cover & the Instrument Cover

Tools Needed: Flat-bladed screwdriver,
Phillips screwdriver.

Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

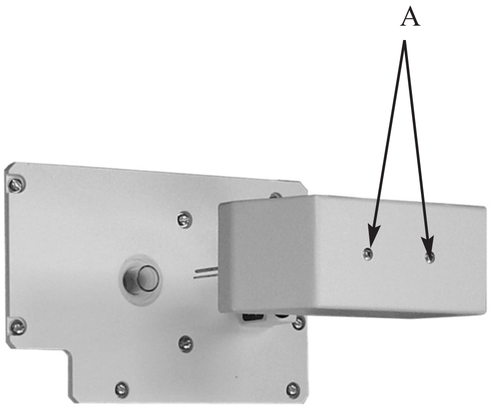
CAUTION: Improper connections may cause damage to the instrument.

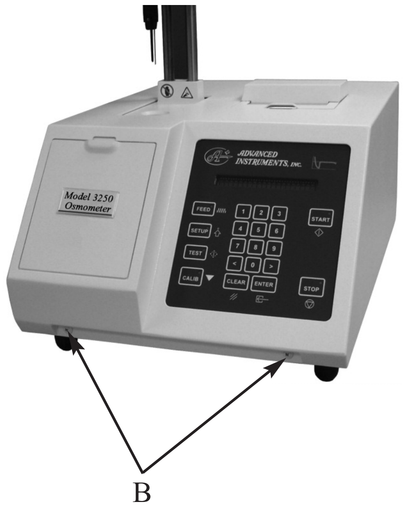
1. Turn off the power and unplug the instrument.
2. Remove the two screws from the head cover (A) and lift off the head cover.
3. **Serial Suffix A:** Remove the two screws from the front (B) and the four screws from the rear panel (C).

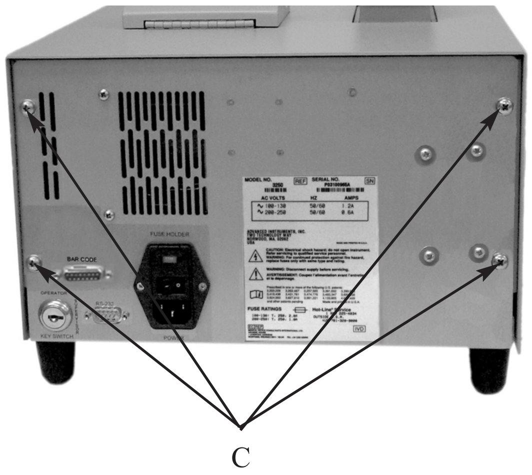
   Serial Suffix B & C: Remove the four screws from the rear panel (C).

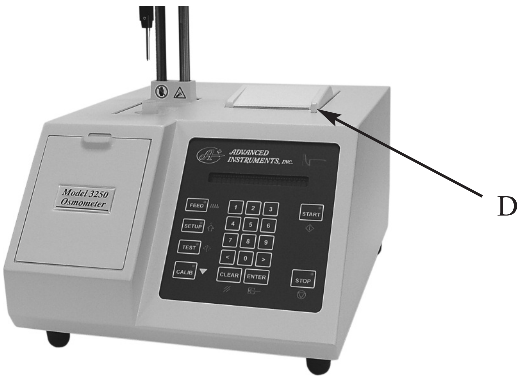
   Serial Suffix D and Higher: Press the printer cover release button (D), then remove the four screws from the rear panel (C).
4. **Serial Suffix A:** Slide the instrument cover up and off.

   Serial Suffix B and Higher: Slide the instrument cover forward, then up and off.









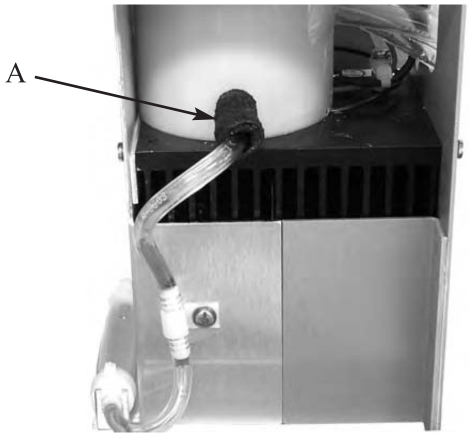
Osmometer/Cryoscope Well Cleaning

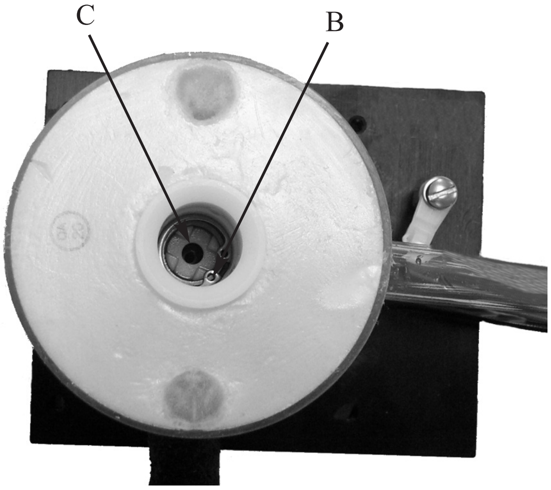
Use this procedure to clean the well and tubing of any foreign matter (e.g., broken glass) that may have fallen into the well.

Tools needed: Flat-bladed screwdriver; Phillips screwdriver; Tru-arc pliers; thin, stiff wire; 4" cable tie; small wire cutters.

Osmometer Well Cleaning

1. Turn off the power and unplug the instrument.
2. Remove the head cover and instrument cover (see Removing the Head Cover & the Instrument Cover).
3. Drain the cooling system (see Cleaning and Maintenance).
4. Disconnect the fluid pump from the cooling well, as follows:
    a. Unwrap refrigeration tape (A). Save for re-use during reassembly.
    b. Cut and remove the cable tie.
    c. Pull the tubing off of the cooling well inlet port.
5. Using a pair of Tru-arc pliers, remove the Tru-arc retainer ring (B) from inside the well. (Save the retainer ring for replacement when cleaning is complete.)





6. Remove the white Delrin elevator and spring (C). (Save for replacement when cleaning is complete.)
7. Inspect the bottom of the well and remove any visible debris. Be sure to clean out the small hole at the bottom of the well.
8. Using a thin stiff wire, insert it into the well inlet port.

Note: *The wire diameter MUST be small enough to pass through, into the well. The .050" diameter X 4.00" long 4LH243 stir wire is ideal.*

9. Push the wire into the well. Repeat this process several times, sliding the wire back and forth until the end of the wire is visible in the hole at the bottom of the well. (This should loosen any deposit trapped in the tube and the well.)
10. Reassemble the pump tubing to the well, apply the cable tie, and then reapply the refrigeration tape.
11. Using a solution of 1:5 bleach in distilled water, place the filter and well return line into this solution. Manually press the pump up and down until the solution has

circulated through the pump and well, and into the bottle.

12. When satisfied that the solution is free-flowing, flush the bleach solution with clean water, then stop and drain the cooling system.

13. Reassemble the instrument by replacing the spring (C) and elevator (B), securing with the Tru-arc retaining ring, then replace the head cover and instrument cover.

14. Add a new bottle of heat transfer fluid and prime the pump. The instrument is ready for testing.

Cryoscope Well Cleaning

1. Turn off the power and unplug the instrument. Remove the heat transfer fluid from the front cover.

2. Follow steps 2-4 from the Osmometer Well cleaning instruction (previous page).

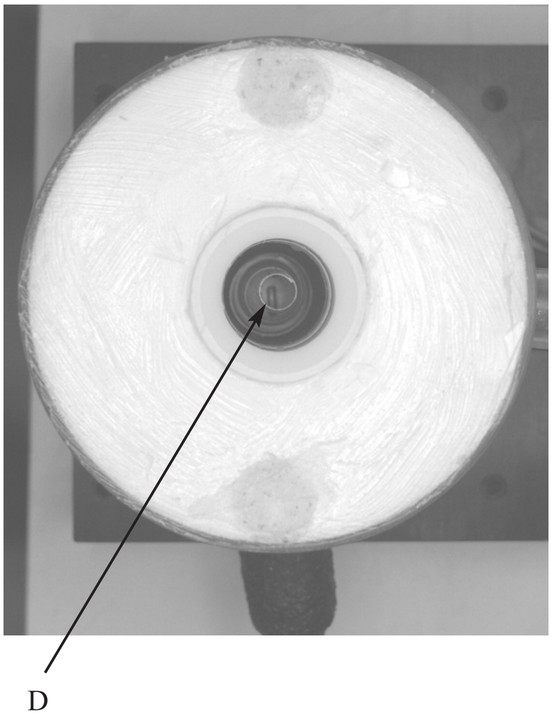
3. Remove the spring (D) from the well and set aside, to be replaced after cleaning.

   Note the orientation of the spring as you remove it from the well, wide-end down.

4. Follow steps 7-12 from the Osmometer Well Cleaning instruction.

5. Replace the spring (wide-end down) into the well and reassemble the instrument by replacing the instrument cover and the head cover.

6. Add a new bottle of heat transfer fluid and prime the pump. The instrument is ready for testing.



Cleaning and Lubricating the Printer

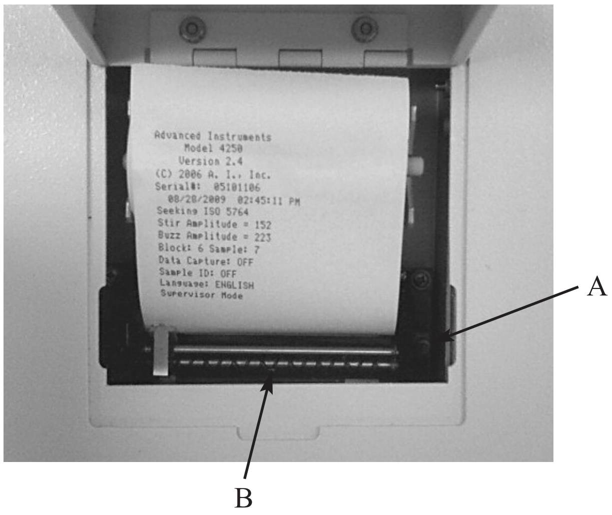
(Serial Suffix A - C, only)

Use this procedure to clean and lubricate the printer feed mechanism.

Tools needed: Nyogel 744 lubricant and cleaning patches (*Printer Maintenance Kit FL0425*).

1. Open the printer cover on the top of the instrument. There is no need to shut off power or remove any of the instrument covers to perform this maintenance.
2. If paper is installed in the printer, cut the paper between the printer mechanism and the paper roll, then remove the paper roll.
3. Remove the paper from the printer mechanism by pulling it forward through the printer mechanism. If necessary, use the **FEED** key on the instrument keypad or the printer paper feed button (A) to advance the paper.

CAUTION: ⚠ DO NOT PULL THE PAPER BACK THROUGH THE PRINTER. THIS WILL DAMAGE THE PRINTER PAPER FEED MECHANISM.



```
Advanced Instruments
     Model 4250
    Version 2.4
(C) 2006 A. I., Inc.
Serial#:  05101106
 08/28/2009  02:45:11 PM
Seeking ISO 5764
Stir Amplitude = 152
Buzz Amplitude = 223
Block: 6 Sample: 7
Data Capture: OFF
Sample ID: OFF
Language: ENGLISH
Supervisor Mode
```

4. Use a cleaning patch to wipe all grease from the printer bar (B).
5. Apply three drops of Nyogel 744 evenly across the entire printer bar.
6. Press either the **FEED** key on the instrument keypad or the printer paper feed button to exercise the printer paper feed mechanism 5-to-10 cycles to evenly distribute the lubricant over the printer bar.
7. Wipe the printer bar with a fresh cleaning patch.
8. Lubricate hte printer bar a second time with three evenly-spaced drops of Nyogel 744.
9. Press either the **FEED** key on the instrument keypad or the printer paper feed button to exercise the printer paper feed mechanism 5-to-10 cycles to evenly distribute the lubricant over the printer bar.
10. Reinstall the printer paper (see User's Guide).
11. Feed paper through the slot in the printer cover, then close the printer cover to complete maintenance.
12. Instrument is ready for use.

Probe & Stir/Freeze Wire Alignment

Proper alignment and adjustment of the mandrel, probe and stir/freeze wire are of utmost importance to assure accuracy, precision and proper operation of the instrument.

Note: *After making any probe and/or stir/freeze wire adjustments, the instrument calibration must be checked and adjusted as necessary.*

Use the probe alignment tool and follow the Probe Alignment Tool instructions located in the Replacement Instructions section of this manual.

4. Troubleshooting

Introduction

Problems with the performance of the 3250/4250 are usually identified by the software and displayed as error messages. The troubleshooting table on the following pages lists all error messages, indicates why the software generated the message, and lists what may be causing the problem.

Error messages may be caused by mistakes during testing, worn or defective parts, or parts set to the wrong specifications. This section includes directions for:

- checking and resetting the stir & freeze amplitude settings and the probe bin settings;
- aligning the probe and stir-freeze wire, and adjusting the head sensors;
- using the A/D test to check the block probe, sample probe, and cooling assembly.

NOTE: Before you repair or replace any parts, turn the instrument off and then back on after a short delay. This allows the software to reinitialize, and may correct what appears to be a serious hardware problem.

CAUTION: Some troubleshooting requires the instrument to be turned on while the cover is removed. Use extreme caution when operating the instrument without the cover. Hazardous voltages are present at the AC input and circuit components connected directly to the AC input. Refer to the system schematic for additional information.

Freeze “Buzz” Amplitude

To check and reset the freeze amplitude setting:

1. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. Press **TEST**. Press **<** or **>** to select “**Stir/ Freeze Test**”, and then press **START**.

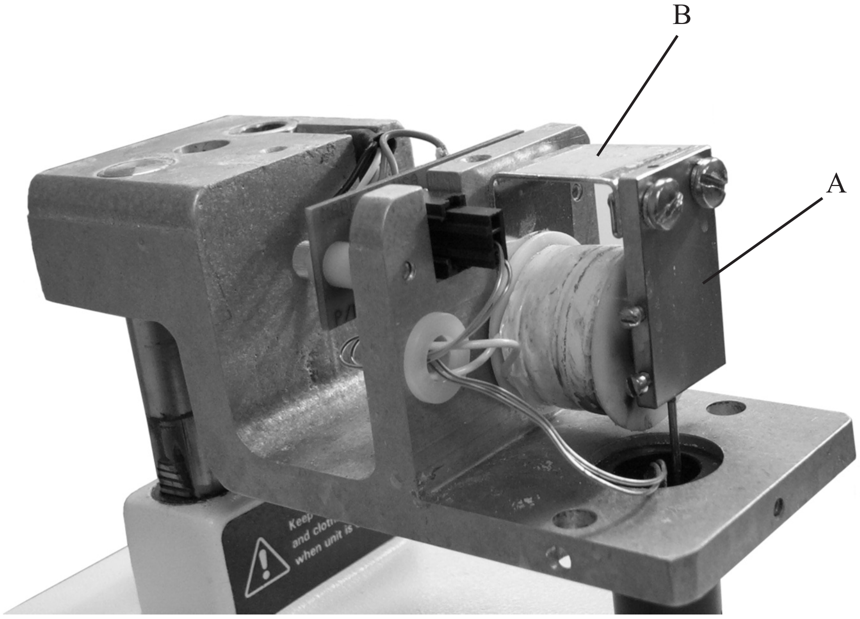
3. At “**[stir] [freeze]**”, watch the tip of the stir/freeze wire and press **>**. The freeze vibration should buzz loudly, and the vibration blur at the tip of the wire will last one second. The amplitude should measure about 13mm (1/2”).

   If the freeze amplitude is not within the correct range, follow steps 4-6 below.

4. Remove the head cover and clear away any metal chips between the coil frame and the clapper (A).

5. Check the position of the yoke (B) and clapper. The yoke must be 90º and flush against the back wall of the head. Bend the yoke if the clapper appears too close or too far away from the coil frame. The clapper *does not* have to be directly parallel to the back wall of the unit.

6. Adjust the freeze “buzz” amplitude, as described in the user’s guide Chapter 2: Changing Operating Settings:



Stir Driver Noise

(Serial Suffix A - C, only)

Excessive noise in the stir amplitude and frequency can affect the quality of the stir signal and introduce excessive pre-freeze errors or cause poor freeze pulse repeatability. The presence of such noise can best be determined with the use of an Oscilloscope.

1. Connect the Oscilloscope between J9-1 and ground.
2. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).
3. Press **TEST**. Press < or > to select "**Stir/ Freeze Test**", and then press **START**.
4. At "**[stir] [freeze]**", press <.

The stir wire driver signal should be a clean, square wave at approximately 72 Hertz and 4Vdc (see figure 1). If not, verify that two ferrite beads are present in your unit, as shown in Installation Option A or B, below.

If the beads are missing, purchase Advanced Instruments Part No. 91035 and install, as shown.

If the beads are present and you still have noise as shown in figures 3 or 4, replace the driver transistor PCB522.

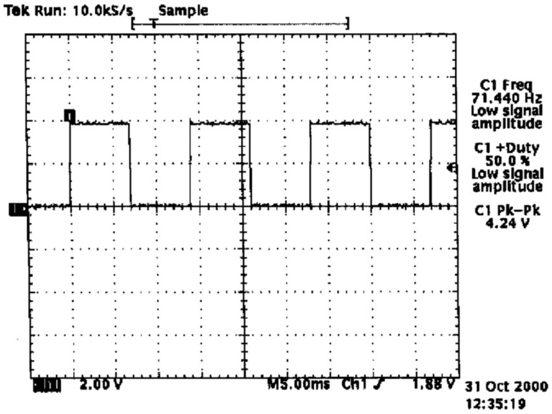


Figure 1. Good signal.

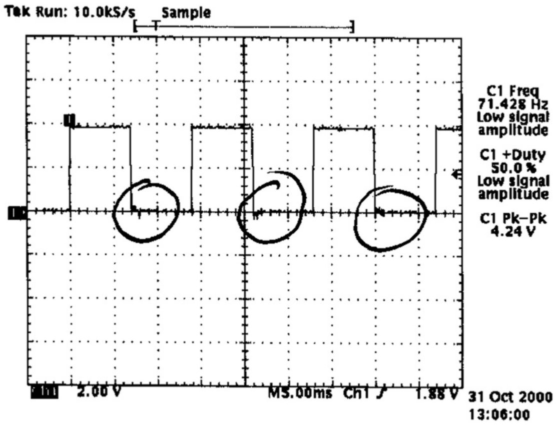


Figure 2. Can be cleaned up with ferrite bead. Acceptable if stir wire not affected.

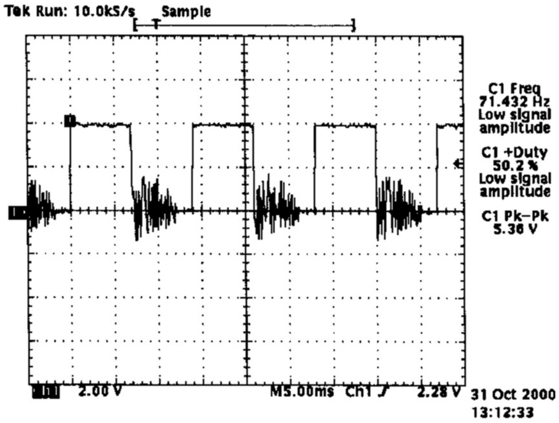


Figure 3. Not acceptable. Replace stir wire driver or use ferrite bead.

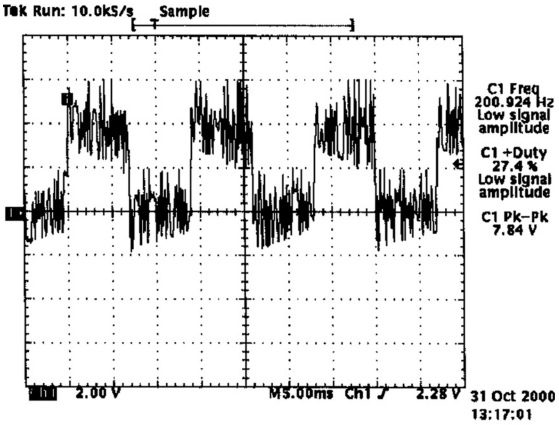
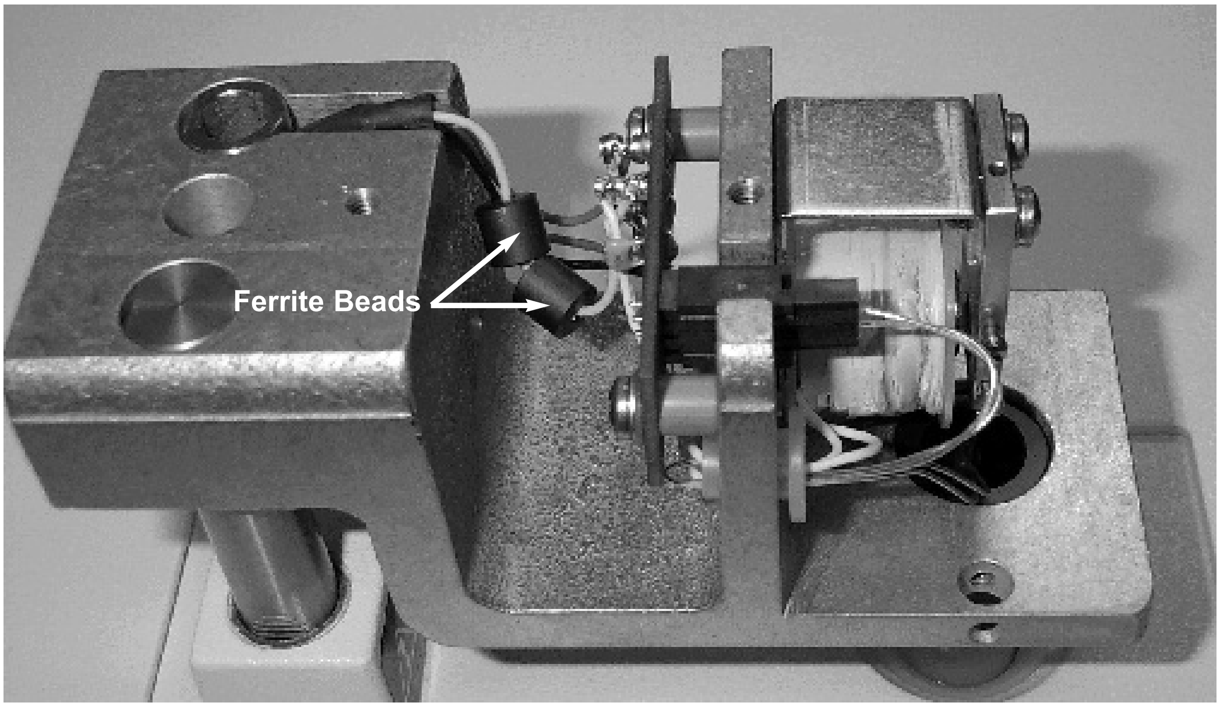


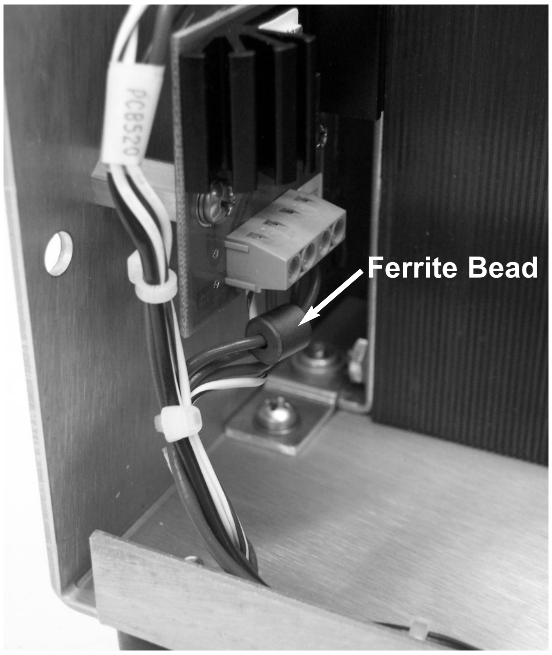
Figure 4. Not acceptable. Replace stir wire driver or use ferrite bead.

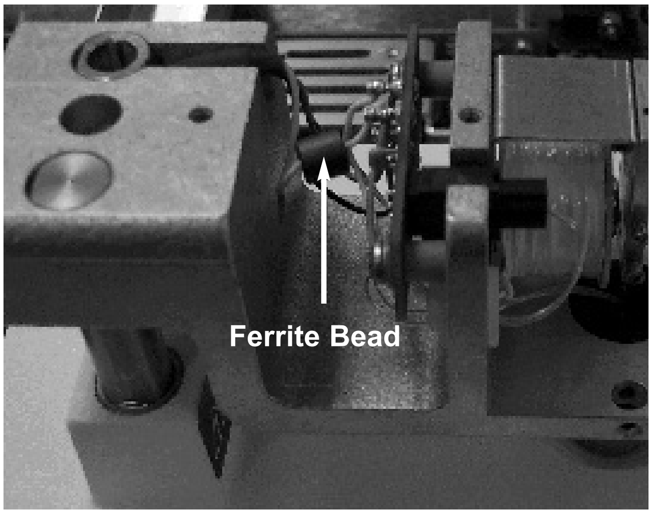
Installation Option A:



NOTE: For installation option A, two ferrite beads are installed on the white wire exiting the head shaft and attached to TR2 on the head transitionn board.

Installation Option B:



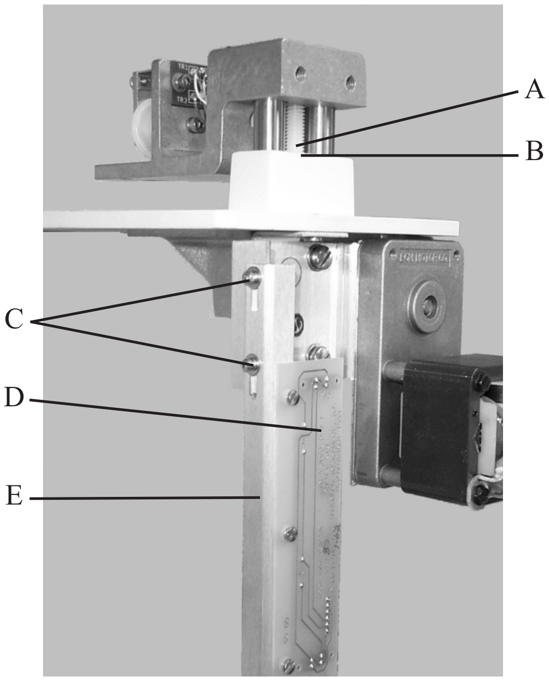


NOTE: For installation option B, one ferrite bead is located on the light blue wire running between PCB522 pin 4 and J3B. The second ferrite bead is located on the white wire exiting the head shaft and attached to TR2 on the head transition board.

Head Sensor Adjustment

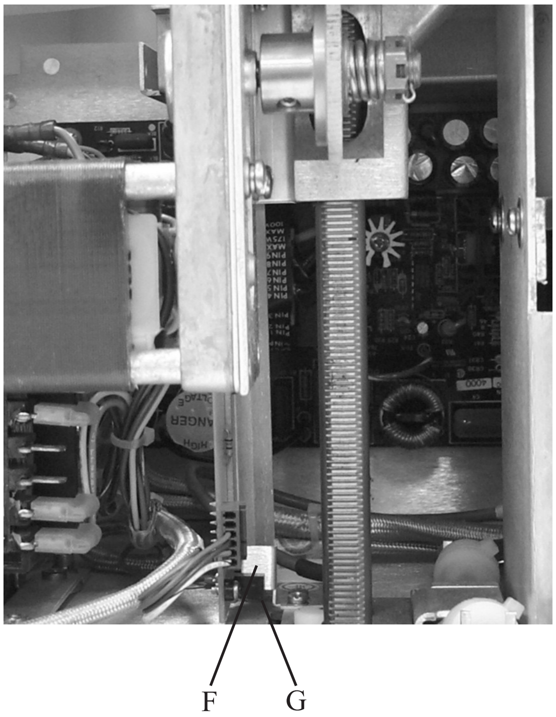
1. Turn off the power and unplug the instrument. Remove the instrument cover and the head cover. Place an empty sample tube in the sample well.

2. Manually push the head all the way down until the head stop screw (A) meets the base of the deck (B).



3. The head position sensors are located on the head sensor board. To adjust the head sensor position, use an Allen wrench and loosen the two bracket screws (C), and move the board (D) and bracket (E) either up or down until the head sensor flag (F) is in the middle of the head down sensor (G).

Note: *To facilitate access to the two bracket screws (C), loosen and move the printer bracket assembly.*



Note: *Your instrument is equipped with a series of diagnostic LEDs on the main application board PCB605 to allow visual identification of drive signals and sensor activation.*

- *The yellow LEDs marked "Drive Up" and "Drive Dn" indicate that the control electronics have issued a command to the head motor relays.*
- *The red LEDs marked "Head Up" and "Head Dn" indicate that the corresponding optical sensor has been tripped.*

Head Up/Down Test

1. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required). Place an empty sample tube in the sample well.

2. Press **TEST**. Press **<** or **>** to select "**Head Up/ Down Test**", and then press **START**.

3. Place an empty sample tube into the freezing chamber.

4. At "**[START] Test [STOP]**", press **START**.

   The head should move continually up and down.

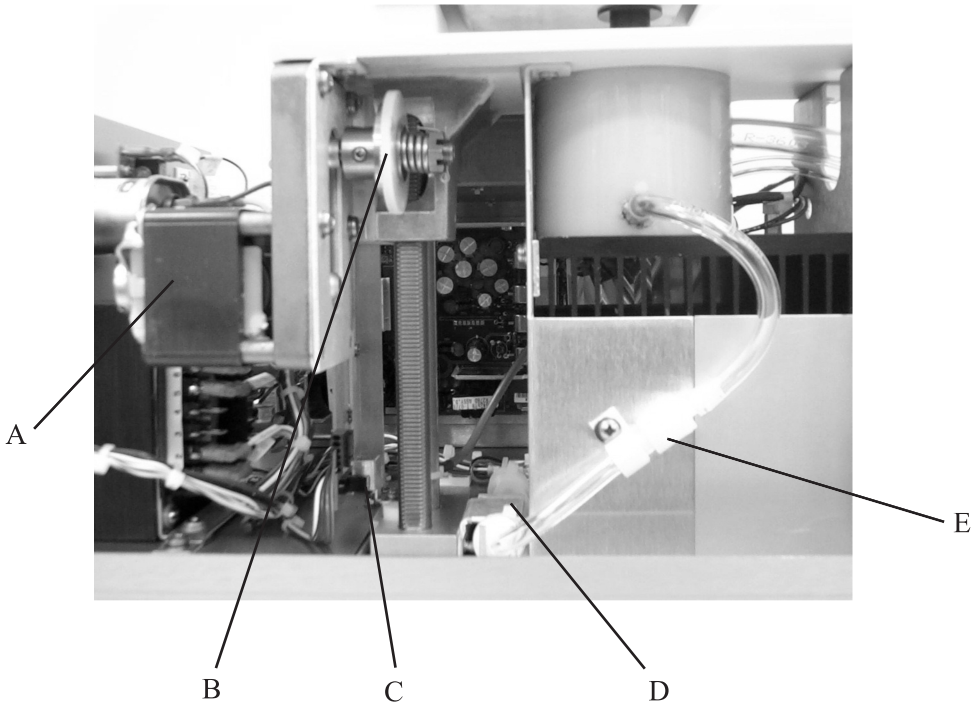
Use this test to ensure the following components are working properly:

- The motor (A) is running.
- The gears (B) are turning properly.
- The sensors (C) are detecting the head-up and head-down conditions.
- The sample well fluid passage (D) is not obstructed by debris, and the pump is moving the heat transfer fluid into the freezing chamber.

Note: *If the sample well fluid passage is obstructed, disassemble and clean the sample well following the instructions found earlier in this section. Also, examine the one-way check valve (E) to make sure it is not stuck open or closed.*

Note: *Your instrument is equipped with a series of diagnostic LEDs on the main application board PCB605 to allow visual identification of drive signals and sensor activation.*

- *The yellow LEDs marked "Drive Up" and "Drive Dn" indicate that the control electronics have issued a command to the head motor relays.*
- *The red LEDs marked "Head Up" and "Head Dn" indicate that the corresponding optical sensor has been tripped.*



Power On Diagnostics

Place a tube with saline or distilled water in the sample well. Turn on the instrument At "**Press START to Continue**", press **START**. The instrument performs a check of the cooling assembly and the probes. If a Block Probe Failure, Sample Probe Failure or Cooling System Error message displays, use the A/D tests to perform further testing.

A/D Tests

Note: *You must set the correct sample and block bin numbers before performing A/D tests.*

1. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. Press **TEST**.

3. Press < or > to select "**A/D Tests**". Place a sample tube containing either isopropyl alcohol or a high value standard into the freezing chamber, and press **START**.

4. The display will change to:

   off Blk NNNN.NN ohm

   readout
   (resistance or temperature)

   channel setting
   (sample or block)

   target temperature
   (off, +1 to -8)

5. Set the target temperature from +1°C to -8°C by pressing < sequentially.

6. Press > sequentially to read:

   Block probe resistance in ohms,
   Sample probe resistance in ohms,
   Block probe in degrees Celsius,
   Sample probe in degrees Celsius, or
   Cooling block duty cycle (a % value).

Block probe resistance will indicate current temperature. The probe begins to cool after the target temperature is set, and the resistance increases until it reaches the target temperature.

Sample probe resistance will indicate current temperature. The probe begins to cool after the target temperature is set, and the resistance increases until it reaches the target temperature. Due to thermal mass considerations between the positions of the block and sample probes, the sample probe may be ± 0.5ºC of the block probe reading.

Duty cycle displays the percentage of time that the thermoelectrics power is on. When the thermoelectrics begin to cool, the duty cycle is usually at 100%. As the instrument stabilizes, the duty cycle decreases to around 60%.

Increased ambient operating temperatures do not affect the sample probe reading, but will increase the observed duty cycle, up to 85% at the maximum temperature of 35ºC.

Variations in ambient non-condensing relative humidity have no effect on the sample probe reading or duty cycle.

The following situations indicate a problem with either the probes or the cooling assembly:

- The resistance reading is replaced by the number 0. Scrolling from right to left indicates an open circuit.

- The target temperature cannot be reached, but probe readings that vary around ambient indicate a cooling system problem.

To determine if a faulty probe is causing the problem:

1. Disconnect the probe from the main board.
2. Place a 6 Kohm fixed resistor across pins 1 and 2.
3. If the resistance display changes to approximately 6,000 ohms, replace the probe.

   If the resistance does not change, replace the main control board or application board.

If the resistance on ***both*** channels does not increase, or if the temperature reads approximately ambient while a target temperature is set, the situation indicates a problem with either the cooling assembly or application board.

To determine which component is faulty:

1. Remove the empty tube from the freezing chamber.
2. Set the target temperature to **-8**.
3. Raise the head manually and place a thermometer inside of the freezing chamber.
4. If the temperature inside the freezing chamber drops to approximately -8ºC, the cooling assembly is working, and the application board needs to be replaced.

   If the temperature remains at room temperature, replace the cooling assembly.

Note: *When the A/D channel is open, there is a thirty-second delay in response to any resistance change.*

CAUTION: If the A/D test sample freezes, allow it to thaw before attempting to remove the sample probe.

Sample Bin Setting

If you do not know the sample bin number, or if you want to verify the sample bin number:

1. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).
2. Press **TEST**. Press < or > to select "**Probe Bin Test**", and then press **START**.
3. Place a sample of Probe Bin-Setting Fluid into the freezing chamber.
4. At "**[START] Ready?**", press **START**.
5. At the end of the test, record the sample probe resistance and the bin number, and then press **STOP**. The display will change to "**Probe Bin Test**".

   To set the correct sample bin number, follow steps 6-8.

   If the current sample bin number matches the number just recorded, press **STOP** *twice* to exit the menu.
6. Press **SETUP**. The Supervisor/Operator keyswitch must be in the Supervisor position.
7. At "**Select Setup Item**", press < or > to select "**Select Sample Bin #**", and then press **START**.
8. If the current sample bin number is not the same as the one recorded in step 5, enter the correct number, press **ENTER** *twice*, and then press **STOP** *twice* to exit the menu. Recalibration will be required.

Block Bin Setting

1. Turn off the power and unplug the instrument. Remove the cover and record the block probe bin number located on the block probe wire.

2. Replace the cover. Plug in the instrument and turn it on. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

3. At "**Press START to Continue**", press **SETUP**.

4. At "**Select Setup Item**", press **<** or **>** to select "**Select Block Bin #**", and then press **START**.

5. Enter the correct number and then press **ENTER** *twice*.

6. Press **STOP** to exit the menu. Recalibration will be required.

Stir Amplitude

1. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. Press **SETUP**. Press **<** or **>** to select "**Set Stir Amplitude**", and then press **START**.

3. Watch the vibration blur at the tip of the stir/freeze wire. If the amplitude is not within the range specified below, press > to increase the amplitude, or press < to decrease the amplitude. (The default is 100, but your value may differ.)

   3250: The stir wire movement should be no wider than the width of the sample probe.

   4250: The stir wire movement should be twice the width of the sample probe.

4. If using a glass sample tube, check the setting by placing a sample (water or standard solution) in position on the probe. If bubbles form in the sample, or if the stir wire hits the tube, the current setting is too high and must be adjusted downward.

5. When the setting is correct, record the new stir amplutide number for your records, and press **ENTER**.

6. At "Set Stir Amplitude", press STOP to return to "**Osmometer (*or Cryoscope*) Ready**".

Note: *Stir wire movement should be stable. If movement has erratic amplitude, driver transistor PCB520 may need replacement. Use an oscilloscope at J9-1 to verify the presence of a clean, square wave (see Stir Driver Noise procedure).*

Display/Printer Test

1. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. Press **TEST**. Press **<** or **>** to select "**Display/Printer Test**", and then press **START** *twice*.

   A continuous string of characters and numbers should scroll across the display, and a single string of the same characters and numbers will be sent to the printer.

   If not, check your connections and try again. If you continue to have a problem and the instrument is working otherwise, the printer or display may need to be replaced (see Replacement Instructions for additional information).

3. Press **STOP** *twice* to end the test and exit the Test menu.

Beeper Test

1. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. Press **TEST**. Press < or > to select "**Beeper Test**", and then press **START** and < to activate the continuous internal beeper.

   If you do not hear the beeper and the instrument is working otherwise, the application board may need to be replaced (see Replacement Instructions for additional information).

3. Press **STOP** *twice* to end the test and exit the Test menu.

Note: *This test will only function if Power On Diagnostics has been completed.*

Keypad Test

1. Turn on the instrument. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. Press **TEST**. Press < or > to select "**Keypad Test**", and then press **START** to activate the keypad test. Each key pressed should respond on the display with the key name, and activate the corresponding LED, if present.

   If any keys or LEDs do not respond, check the narness connections and repeat the test. Otherwise, the keypad or application board may need to be replaced (see Replacement Instructions for additional information).

3. Press **STOP** *twice* to end the test, and **STOP** again to exit the Test menu.

Barcode Test

1. Turn on the instrument.

2. Press **TEST**. Press < or > to select "**Barcode Test**", and then press **START** to activate the barcode test. Using the attached scanner, begin scanning barcodes. Each scan should display on the instrument.

   If the barcode does not display, check the connections. Try resetting the scanner to the factory defaults using the scanner manual or included Advanced Instruments documentation. Verify with the scanner manual that the type of barcode you are using is activated.

   If you are still having problems, contact Advanced Instruments for service.

3. Press **STOP** *twice* to end the test and exit the Test menu.

Note: *This test will only function if Power On Diagnostics has been completed.*

Reset Serial Number

The instrument serial number appears when you power up the instrument. If you need to reset the serial number:

1. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. At "**Press START to Continue**", press SETUP.

3. Cycle through the menu options by pressing < or > until you reach "**Serial Number**", and then press **START**. The display will read "Serial#:********".

4. Press the following keys consecutively: **2, 4, CLEAR**. The displayed serial number will disappear.

5. Enter each digit of the serial number as it appears on the label on the back of the instrument (*Note: the letter suffix at the end of the serial number will not be entered*). When the number is correct, press **ENTER**.

   The serial number will be recorded in memory and should appear the next time you power up your instrument.

Instrument Software Updates

Software for Advanced Instruments model 3250/4250 instrument is contained in factory-installed integrated circuits called Flash EPROMs, “Electrically Erasable Programmable Read-Only Memory”, and is sometimes referred to as “Firmware”.

This type of memory is furnished in two PLCC (Plastic Lead Chip Carrier) devices on the 325620/425620/325621/425621 processor board at locations U3 and U4. U3 is the lower 8 bits of the 16-bit processor address bus, and U4 is the upper 8 bits.

Advanced Instruments products using this “FLASH” technology can be field-updated using a Windows PC and Advanced Instruments serial cable. For the latest instructions on performing the RS-232 port firmware upgrade, consult the documentation supplied with the upgrade package. For information on available updates, consult Advanced Instruments or your dealer.

Performing FLASH firmware update

Performing this update should not affect any of your calibrations or system settings unless the update has made changes to this area of memory. For specific information, consult the documentation included with the update.

Method without opening cover

Your instrument has a three-position Operator/Supervisor keyswitch.

1. Turn off the instrument. Select the 45º position between Operator and Supervisor.
2. Attach the Advanced Instruments serial cable between your PC and the instrument.
3. Turn on the instrument. The display should read “Flash BOOT Program”.
4. Perform the download, using the instructions provided with the update software.

   After download is complete, the instrument will reboot and report the new software version.
5. Turn off the instrument and return the Operator/Supervisor keyswitch to the desired position.

Method with cover removed

Note: ⚠ *Since this procedure requires opening the case, this update should be performed only by an authorized technician.*

1. Turn off the power and unplug the instrument.
2. Remove the instrument cover (see section 2 for instructions on removing the instrument cover).
3. Locate the 325620/425620/325621/425621 processor board (smaller of two).
4. Locate SW1 dip switch on the processor board if it is a 3-position switch. Locate switch position 3 (lower switch) and select the CLOSED, ON, or 1 position. If it is a 4-position switch, locate switch position 1 (upper switch) and select the CLOSED, ON, or 1 position. Do not change any other switch setting.
5. Attach the Advanced Instruments serial cable between your PC and the instrument.
6. Plug in and turn on the instrument. The display should read “Flash BOOT Program”.
7. Perform the download, using the instructions provided with the update software.

After download is complete, the instrument will reboot and report the new software version.

8. Turn off the power and unplug the instrument.

9. Restore SW1 position 3 (3-position switch) to the OPEN, or position 1 (4-position switch) OFF, or 0 position.

10. Replace the instrument cover.

11. Reattach the power cord and return the instrument to use.

If any problems occur, check the connections and switch position settings, and then try the download again. If after download the instrument does not function correctly, consult the rest of this service manual before contacting Advanced Instruments for service.

Option Switch Settings

The processor board is equipped with a dip switch. Each switch position and combination of positions can be used to configure different programming options, such as the programing option listed above for Flash update mode.

If your settings should accidentally get changed, or your replacement processor board is shipped from the factory with the incorrect settings for your product, the following tables detail the appropriate switch positions for restoring your instrument to proper operation.

Option Switch Setup Table - 3-Position Switch

		SW1		
Switch Function	**Selections**	**1**	**2**	**3**
#1 Selects Instrument	3250	ON		
	4250	OFF		
#2 Selects Printer	Citizen		ON	
	Seiko		OFF	
#3 Selects Mode	Program			ON
	Normal Operation			OFF

Option Switch Setup Table - 4-Position Switch

		SW1			
Switch Function	**Selections**	**1**	**2**	**3**	**4**
#1 Selects Mode (“PROG”)	Flash Boot	ON			
	Normal Operation	OFF			
#2 Selects Printer (“OPT1”)	Citizen		ON		
	Seiko		OFF		
#3 Selects Instrument (“OPT2”)	3250			ON	
	3250			OFF	
#4 Not in Use (“OPT3”)	N/A				ON
	N/A				OFF

NOTES:

1) ON = 1 = CLOSED
OFF = 0 = OPEN
2) Seiko printers are used with Serial Suffix A - C; Citizen printers are used with Serial Suffix D and higher.
Refer to Design Changes for additional information.

Troubleshooting Table

Symptom	Explanation	Suggested Action
1. Abrupt loss of power (no display)	Interrupted power connection or loss of power.	1. Make sure the power cord is firmly plugged into both the wall outlet and the socket on the back of the instrument. 2. Temporarily unplug the power cord from its wall outlet and replace it with a known workable lamp or small appliance. Have the power restored. 3. Measure the AC voltage supplied at the power outlet used for this instrument. 4. Unplug the power cord from the power cord socket. Visually check the fuses for a blown fuse. If there is any doubt, test the fuses with a continuity checker or ohmmeter or simply replace them. 5. Check the values marked on the fuses. 6. Replace blown or incorrect-value fuses with time delay (T) fuses. Refer to instrument serial number label for proper fuse value. 7. If a fuse was blown and a replacement fuse blows too, contact our product service department for assistance.
2. “A/D Init Failure” “A/D High Filter Error” “A/D Low Filter Error” “A/D Cal Mode Error”	One or both A/D converters lost initialization.	1. Turn power off and on. 2. If problem persists, replace application board.
3. “Baudrate Error”	The baudrate setting is out of range.	Reset baudrate in SETUP menu.
4. “Block Probe Failure”	The block probe has failed (usually shorted).	Check the block probe resistance (2,300 ohms ±300 at room temp.)
5. "Block Probe Open?"	The block probe resistance is greater than A/D converter can measure.	1. Is the probe plugged in? 2. Check the block probe resistance (2,300 ohms ±300 at room temp.)
6. Buzz Point Default Set	The freezing point setting was outside the allowed range. The default setting has been automatically set.	1. For the 3250, use SETUP menu to change, if desired. 2. For the 4250, this is a fixed value.
7. “Calibration Cancelled”	The **STOP** button was pressed during calibration.	Calibration cancelled.
8. “Calibration Out of Range; Repeat”	The range of the samples tested did not repeat well enough for calibration.	1. Recalibrate the instrument. 2. Check freeze pulse. 3. Check sample size and quality. 4. Check probe alignment.

Symptom	Explanation	Suggested Action
9. "Check Calibration" (3250 only)	Buzz point setting has been changed.	1. Spot-check calibration. 2. Recalibrate, if needed.
10. “Cooling System Error”	The cooling assembly may not be functioning properly.	1. Check the cooling assembly. 2. Make sure there is heat transfer fluid in the cooling well. 3. Verify control signal using LED D16. 4. Let unit warm up and try Power On Diagnostics again.
11. “Count Error; Parameter RAM”	A memory check error occurred in the RAM.	1. Turn the power off and on. 2. If problem persists, replace processor board.
12. Display blank or has blinking cursor	Display has experienced a voltage drop below its reset threshold.	1. Turn power off and on. 2. If problem persists, replace application board.
13. Display flashing or scrolling rapidly	Display is functioning normally, but is displaying an abnormal message (message length exceeds 20 characters).	1. Press STOP if in diagnostics. 2. If problem persists, contact Advanced Instruments for Hot-Line Service.
14. EPROM Failure	This indicates a memory error with the FLASH memory.	1. Try restarting the instrument. 2. Replace the processor board.
15. "Error Reading Barcode”	The data received from the barcode reader was not formatted correctly. Was the barcode over 13 characters long?	1. Turn the power off and on. 2. Check barcode scanner settings. 3. If problem persists, replace application board.
16. ESC TRAP	Indicates general operating system code fault.	1. Turn the power off and on. 2. Replace the processor board.
17. “Event Record Lost”	The instrument has lost its record from memory.	1. Turn the power off and on. 2. If problem persists, replace processor board.
18. “Fan System Failure”	The fan is not functioning properly.	1. Check fan driver/control circuit. a. Make sure the fan is plugged in. b. Make sure the fan isn’t blocked. c. Check the fan driver LED on the application board. d. To check fan, disconnect and connect to bench-top 12 VDC power supply. 2. Replace the fan or application board.

Symptom	Explanation	Suggested Action
19. “Flash Boot Program”	The instrument is configured to receive Flash EPROM updated code.	1. If intentional, perform download process as described in this manual. 2. If not intentional, turn off power and set three-position Operator/Supervisor key-switch to Operator or Supervisor position. 3. Check processor board option switch SW1 position 3 and set to OPEN/OFF/0 (see Option Switch Setup Table).
20. ‘FPE_INTOFLOW” “FPE_INTDIV0” “FPE_INVALID” “FPE_ZERODIVIDE” “FPE_OVERFLOW” “FPE_UNDERFLOW” “FPE_INEXACT” “FPE_STACKFAULT” “FPE_EXPLICITGEN” “FPE_UNDEFINED”	Indicates various floating point math errors have occurred.	1. Turn the power off and on. 2. Replace the processor board.
21. “Head Not Up” “Head Not Down”	The head up/down mechanism may not be functioning properly.	1. Check the motor, clutch assembly and relays by running the head up/down test. 2. Check the Head Up or Head Down position sensor. 3. Check LED indicators on application board.
22. ID None	No sample ID was recorded when test was run.	1. Are you using ID? If no, ignore message. 2. Verify ID # prints at the end of your test. 3. Reboot and check for Low Battery message.
23. “Insufficient Data”	Less than two valid results were found in the requested statistics calculation.	1. Change the number of samples requested for statistical calculations. 2. Continue testing to add more results to the buffer.
24. Keypad keys unresponsive	Connections to the keypad may have become disconnected, or the keypad has failed.	1. Check circuit connections to the keypad (refer to system schematic). 2. Replace the keypad.
25. Low Battery	The lithium battery contained inside the NVRAM memory is too low to maintain stored information, calibration, and system settings. The instrument will function normally as long as the main power remains on.	Contact Advanced Instruments for Hot-Line Service.

Symptom	Explanation	Suggested Action
26. Low Fluid Level in Freezing Chamber	1. The heat transfer fluid pump may be malfunctioning, or there may be a leak or obstruction in the fluid system. 2. An insufficient amount of fluid is being pumped with each head up/down cycle.	1. Evaluate the functioning of the heat transfer fluid pump per the instructions found in the Maintenance section. 2. If an obstruction is suspected, refer to Osmometer/Cryoscope Well Cleaning, located in the Maintenance section.
27. Memory Allocation Error	Internal memory management error, allocated reserved memory conflict.	1. Turn power off, then on. 2. If problem persists, replace the processor board.
28. "New Software Version"	EPROM has been changed, or new software has been downloaded.	1. Check system settings and proceed. 2. If problem persists, replace processor board.
29. "No Parameters in RAM" "Parameter RAM Failed"	The battery-backed RAM has lost its data or has been cleared. The instrument has lost the calibration, data, and probe bin numbers from memory. This may occur during some software updates.	1. Reset sample and block probe bin numbers. Recalibrate the instrument. 2. Reset the stir amplitude. 3. Reset the buzz point (3250 only). 4. Reset plateau mode/range. 5. Reset instrument serial number. 6. Reset any other custom settings 7. If problem persists, replace processor board.
30. "No Plateau, Repeat Test"	The sample did not reach a valid plateau.	1. Make sure the sample is not too viscous. 2. Check the sample probe. 3. Make sure there is heat transfer fluid in the cooling well. 4. Check buzz point setting.
31. No Results to Recall	Recall memory was empty.	1. Run a test and try again. 2. If problem persists, reboot and check for Low Battery message. 3. Contact Advanced Instruments for Hot-Line Service.
32. "Out of Range"	The sample tested was beyond the range of the instrument.	Dilute the sample and retest.
33. Printer advances paper and appears to be printing, but the paper is blank.	Paper has been installed backwards.	Check to make sure the paper roll is properly installed. The paper must feed from the bottom of the roll. Refer to the User's Guide for additional information.

Symptom	Explanation	Suggested Action
34. Printer fails to print.	Printer may be out of paper. Paper feed mechanism may be jammed. Printer may have failed. Serial Suffix D and higher: Printer cover may not be fully closed.	Check paper. If out, install new paper. Press FEED key while oberving printer paper feed mechanism. If either slow or no paper feed is occurring, replace printer. Serial Suffix D and higher: Make sure that printer cover is fully closed. On some models, check diagnostic LEDs D19 and D20 on PCB605.
35. "RAM Failure"	The main board has failed.	Replace the processor board.
36. "Recalibration Needed"	The calibration data has been lost frommemory. This is caused by: a. battery back-up failure b. installation of a new processor board c. corruption of system memory d. new probe bin numbers	1. Recalibrate the instrument. 2. If error message persists after successful calibration, replace the processor board.
37. "Reset Probe Configuration"	The probe bin data has been lost from memory. This is caused by: a. battery back-up failure, b. installation of a new processor board, c. corruption of system memory, or d. new software/firmware.	1. Reset sample and block probe bin numbers. 2. If problem persists, replace processor board.
38. Results not repeatable (too scattered).	1. Sample probe and stir wire are not properly positioned. 2. Stir amplitude is too low or too high. 3. Freeze amplitude is too low or too high. 4. Sample probe is damaged or defective.	1. Check sample probe and stir wire alignment and position. 2. Stir amplitude should be mixing sample briskly, but without agitation or bubbles. Check and adjust as needed. 3. Freeze amplitude should be just sufficient to freeze sample. Too low and the sample won't freeze, too high and sample will be thrown up on the side walls of the sample tube. Check and adjust as needed. 4. Replace sample probe.
39. "Result Over Range, Try Higher Setting" (3250 only)	The sample tested in the low range setting was over the low range limit.	Retest the sample in the high range setting.
40. "Result Under Range, Try Lower Setting" (3250 only)	The sample tested in the high range setting was under 1400 mOsm.	Retest the sample in the low range setting.
41. "Sample Did Not Freeze, Repeat Test"	The sample did not freeze (after "buzzing").	1. Make sure the sample tube is not empty, and make sure the sample is not too viscous. 2. Check the freeze amplitude. 3. Make sure the instrument is in the proper range. **(3250, only)**

Symptom	Explanation	Suggested Action
42. “Sample Freeze Error, Repeat Test”	The sample did not freeze properly.	1. The sample may have been contaminated. Retest with a fresh sample. 2. Check the freeze amplitude. 3. Check the sample probe.
43. “Sample Pre-Freeze, Repeat Test”	The sample has frozen prematurely (before the “buzz”).	1. The sample may have been contaminated. Retest with a fresh sample. 2. Check sample/block probe bin settings. 3. Check the stir amplitude. 4. Check for stir driver noise.
44. “Sample Probe Failure”	The sample probe has failed (usually shorted).	Check the sample probe resistance (2,300 ohms ±300 at room temp).
45. “Sample Probe Open?”	The sample probe resistance is greater than 10558 ohms.	1. Is the probe plugged in? 2. Check the sample probe resistance (2,300 ohms ±300 at room temp).
46. “Standards Reversed? Repeat Calib”	The instrument was expecting “high” calibrator standard and detected a value below, equal or close to the “low” calibrator standard.	Recalibrate the instrument with the calibrator standards in the correct order.
47. “Stir System Failure”	The stir/freeze mechanism may not be functioning properly.	1. Check the stir and freeze amplitudes. 2. Check stir driver/control circuits. 3. If problem persists, replace the application board or stir driver.
48. “Supervisor Key Needed, Press Stop”	Operator/Supervisor keyswitch is in the Operator position.	1. Press the **STOP** key. 2. Set the keyswitch to Supervisor position.
49. “System Error: Trap” “System Error: NMI” “System Error: Unknown” “System Error: Requests” “System Error: Primitive” “System Error: Interrupt” “System Error: Communications” “Illegal Error Code: “Unknown Error” “Memory Allocation Error”	The software did not execute properly.	1. Turn the power off and on. 2. If problem persists, replace the processor board.
50. “Test Cancelled”	The **STOP** button was pressed during the test.	Retest with a fresh sample.

Symptom	Explanation	Suggested Action
51. "Test Time-out Error"	The test has taken too long to complete.	1. Make sure the sample tube is not empty, and make sure the sample is not too viscous. 2. Make sure there is heat transfer fluid in the cooling well. 3. Check the stir amplitude. 4. Check the sample/probe block bin setting. 5. Check the cooling assembly well. 6. Use A/D test to verify cooling system function.
52. "Thermoelectrics System Failure"	The thermoelectric driver may not be functioning properly.	1. Use the A/D test to check the cooling assembly. 2. Check Q1B driver. 3. Check application board.
53. Unknown error	Undefined software event has occurred.	1. Turn the power off and on. 2. If problem persists, replace the processor board.
54. Wrong instrument model displayed	Processor board option switch SW1.	Reset switch SW1 (see Option Switch Setup Table).

5. Replacement Instructions

Block Probe Replacement Kit: Models 3250/4250
4D3340

Reference: Use this instruction with replacement part 4D3340.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver.

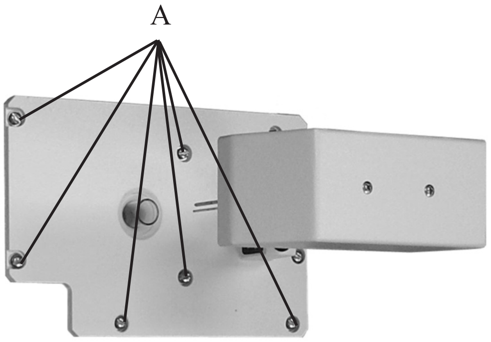
Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

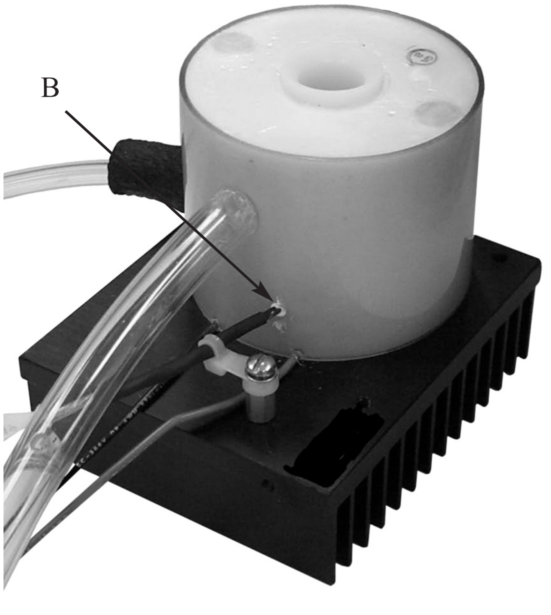
CAUTION: Improper connections may cause damage to the instrument.

Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover, and remove the cover.
3. Remove the screws securing the instrument cover, and remove the cover.
4. Remove the six screws from the deck (A), and remove the deck.
5. Disconnect the block probe from the main circuit board.



6. Remove the cable clamp screw and the cable clamp that secures the block probe cable to the heatsink.
7. Notice the length of probe cable as you remove it from the block. Cut any tie wraps used to create the service loop, and then remove the block probe cable from the Cooling Assembly.
8. Clean out the block probe hole (B) using a .082-inch drill (2.0 mm drill).
9. Insert the tip of the thermal grease applicator all the way into the block probe hole (B). Inject grease into the hole while slowly withdrawing the tip, so that there are no air pockets. Fill the hole with grease. (The thermal grease should surround the probe when it is inserted.)



10. Insert the new block probe cable into the block probe hole until it will not go any further. Insert slowly so the probe is not

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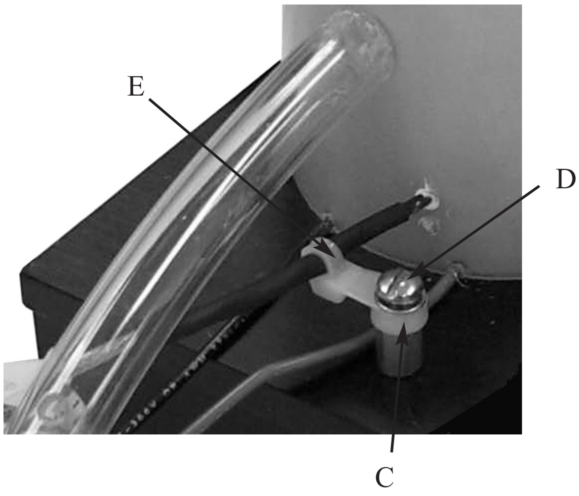
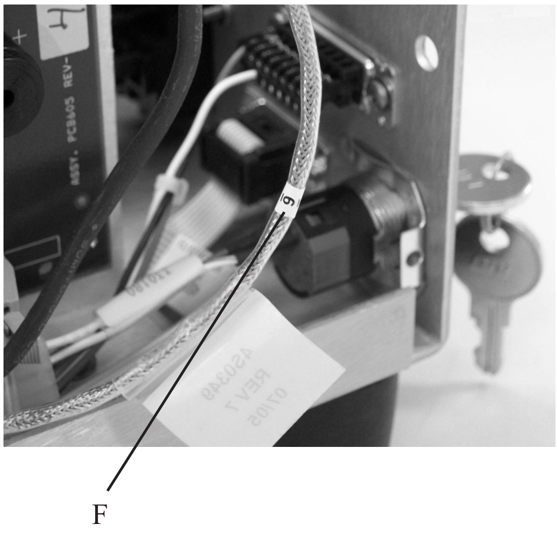
damaged, allowing the thermal grease to be displaced by the probe. Once fully inserted, hold the probe cable in place until excess grease has stopped oozing out and the block probe remains in place. Wipe away any excess grease.

11. Note the block bin number located on the block probe cable (see step 15).
12. Place the cable tie (C) on the stand-off so the tie lock faces up. Insert the washers and the screw into the stand-off (D). Tighten securely.
13. Wrap the cable tie down and around the block probe cable and up through the tie lock (E). Pull the cable tie to tighten. Cut the excess cable tie above the tie lock.
14. Make sure the block probe cable is secure at the stand-off, and make sure it is fastened in the block probe hole.
15. Reassemble by reversing steps 1-5.
16. Set the new block bin number (F) (see the following procedure).

Set Block Bin Number

1. If there is a Supervisor/ Operator keyswitch, turn it to the Supervisor position (if required).
2. At "**Press START to Continue**", press **SETUP**.
3. At "**Select Setup Item**", press < or > to select "**Select Block Bin #**", and then press **START**.
4. Enter the correct number and then press **ENTER**. Press **ENTER** a second time to confirm change.
5. Press **STOP** to exit the menu.
6. Check calibration and recalibrate, if necessary.





Clapper Replacement
3C2241R

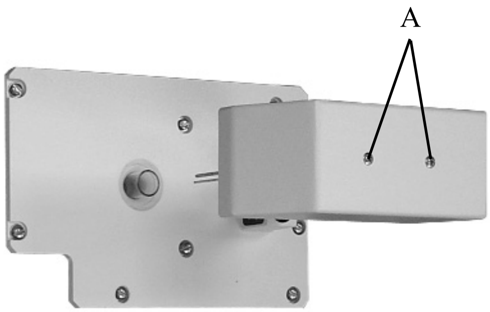
Reference: Use this instruction with replacement part 3C2241R.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, 5/64" Allen wrench, probe alignment tool and instructions.

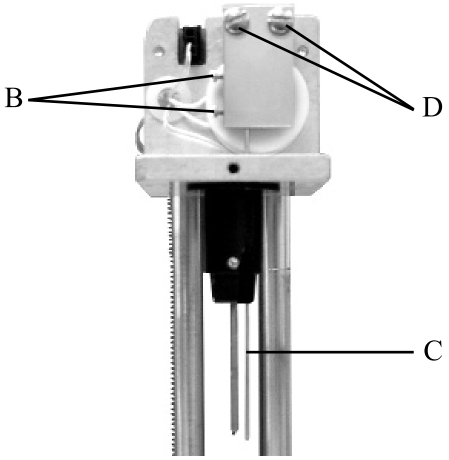
CAUTION: Improper connections may cause damage to the instrument.

Instruction:

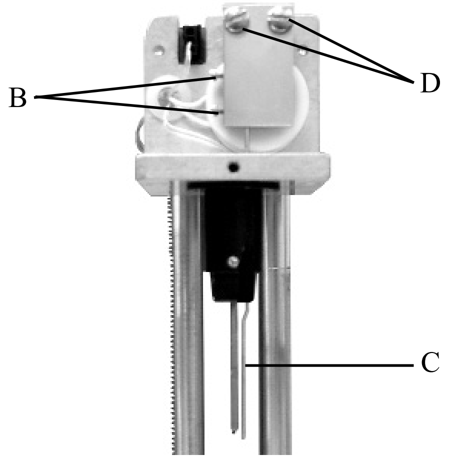
1. Turn off the power and unplug the instrument.
2. Remove the two screws from the head cover (A) and lift off the head cover.



3. Remove the two stir/freeze wire setscrews (B) from the clapper.
4. Gently pull the stir/freeze wire (C) down and out of the clapper.
5. Remove the two screws (D) that attach the clapper to the yoke.
6. Replace the old clapper with the new one and reassemble by reversing steps 2-5.
7. Use the probe alignment tool and instructions to properly position the probe and stir/freeze wire.



4250 / 4D3 Cryoscope



3250 / 3D3 Osmometer

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Control Board Set Replacement
325605R/425605R
Application Board (Only) Replacement
PCB605R
Processor Board (Only) Replacement
325621R/425621R

Reference: Use this instruction with replacement part 325605R, PCB605R, 325621R, 425605R, 425621R.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, static grounding (earthing) wrist strap (included).

Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

CAUTIONS:

- *Power cord must be disconnected to prevent electric shock.*
- *Never unpack, touch or handle any integrated circuit without wearing a grounding (earthing) strap to minimize your static charge.*
- *Instrument calibration and all customized settings will be lost when the main control board set or processor board is replaced. Therefore, make sure the current sample and block probe bin numbers and the sample stir amplitude are recorded in the service log so that you can reset these vital numbers into the replacement board.*
- *Refer to Option Switch Configuration section for proper model selection.*

The following instructions have been prepared to cover several different replacement scenarios. Please read carefully and select the appropriate set of instructions for your situation.

GENERAL INSTRUCTIONS:

1. Record current sample and block probe bin numbers, sample stir amplitude, and any other customized settings that may need to be reset after this procedure.
2. Turn off the power and unplug the instrument.
3. Remove the screws securing the instrument cover, and remove the cover.
4. Attach the static grounding strap to your wrist and stick the adhesive end to a suitable bare-metal ground, such as the rear panel.

Board Set Replacement:

1. Remove the wiring connectors from the application board (larger of two).
2. Gently pry the board set off the four snap-on standoffs.

Note: *Some instruments may require two screws be removed prior to removing the board set.*

3. Remove the replacement board set from its anti-static bag, taking care not to disturb the options/configuration switch SW1 (A), located on the processor board (smaller of two).

4. Press the new board set onto the four snap-on standoffs so that the words “Advanced Instruments, Inc.” are located in the upper left corner. Reinstall two screws, if applicable.

5. Reconnect all wiring connections and proceed to the REASSEMBLE AND CHECKOUT instruction, below.

Application Board (larger of two) **Replacement:**

1. Remove the wiring connectors from the application board (larger of two).

2. Gently pry the board set off the four snap-on standoffs.

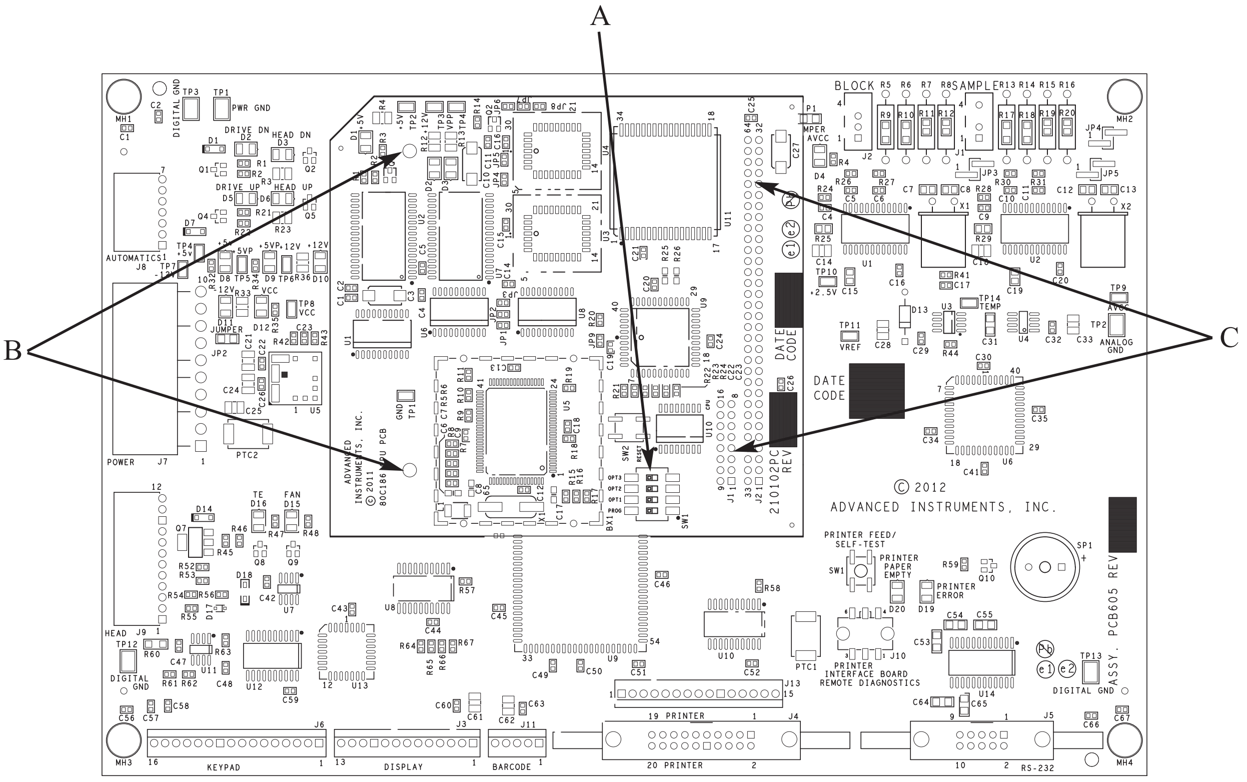
Note: *Some instruments may require two screws be removed prior to removing the board set.*

3. Remove the processor board (smaller of two) by first releasing the two plastic standoffs at locations E3 and E4 (B), taking care not to disturb the options/configuration switch SW1 (A). Next, gently pry the processor board off its J1 and J2 connectors (C) by rocking it from top to bottom.

4. Remove the replacement application board from its anti-static bag.

5. Install the processor board onto the new application board by reversing step 3, being careful to firmly seat the J1 and J2 connections and aligning pins to sockets.

6. Press the new board set onto the four snap-on standoffs so that the words “Advanced Instruments, Inc.” are located


A
B
C
ADVANCED INSTRUMENTS, INC.
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210102PC REV
ASSY. PCB605 REV
BLOCK
SAMPLE
AUTOMATICS
POWER
HEAD
KEYPAD
DISPLAY
BARCODE
19 PRINTER
20 PRINTER
RS-232
DATE CODE
PRINTER FEED/ SELF-TEST
PRINTER PAPER EMPTY
PRINTER ERROR
PRINTER INTERFACE BOARD REMOTE DIAGNOSTICS
DIGITAL GND
ANALOG GND

Two-Board Set

in the upper left corner. Reinstall two screws, if applicable.

7. Reconnect all wiring connections and proceed to the REASSEMBLE AND CHECKOUT instruction, below.

Processor Board (smaller of two) **Replacement:**

1. Remove the processor board (smaller of two) by first releasing the two plastic standoffs at locations E3 and E4 (B). Next, gently pry the processor board off its J1 and J2 connectors (C) by rocking it from top to bottom.

2. Remove the replacement processor board from its anti-static bag, taking care not to disturb the options/configuration switch SW1 (A).

3. Install the new processor board onto the new application board by reversing step 1, being careful to firmly seat the J1 and J2 connections.

4. Proceed to the REASSEMBLE AND CHECKOUT instruction, below.

REASSEMBLE AND CHECKOUT

1. Verify that all wiring connections have been restored, and that they are not offset on the mating board's connector.

2. Remove the static ground strap and put aside until checkout is complete.

3. Replace the cover, taking care not to pinch any wiring.

4, Verify that the power switch is OFF, and then plug in the power cord.

5. Turn on the instrument and verify that the instrument boots up correctly by watching the display and/or printout.

   If you replaced the board set, processor board, or an older single control board configuration, you will need to enter your configuration settings and recalibrate your instrument (next step).

   If you are using the original processor board (application board replacement), you will not need to reenter any settings and may skip to step 8.

6. Use the SETUP menu to reset the sample and block probe bin numbers and the sample stir amplitude, and any other customized settings.

Note: *If values are unavailable, refer to the User's Guide for setup procedures.*

7. Reset the serial number (see the following procedure).

8. Press **STOP** to exit the Setup menu. The instrument will run the self-diagnostics program.

9. Recalibrate the instrument. For further information, refer to your User's Guide.

Reset Serial Number

1. Locate a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. At "**Press START to Continue**", press SETUP.

3. Cycle through the menu options by pressing < or > until you reach "**Serial Number**", and then press **START**. The display will read "Serial#:********".

4. Press the following keys consecutively: **2, 4, CLEAR**. The displayed serial number will disappear.

5. Enter each digit of the serial number as it appears on the label on the back of the instrument (*Note: the letter suffix at the end of the serial number will not be entered*). When the number is correct, press **ENTER**.

   The serial number will be recorded in memory and should appear the next time you power up your instrument.

Option Switch Configuration:

1. Locate options/configuration switch SW1 (A).

2. For the 4-position switch, the four switch positions are numbered 1, 2, 3, 4, starting at the bottom as seen in the photo on page 2.

3. Using the table below, set the switch positions to configure the model number and options for your use.

Note: *Markings on switch body may vary [ON = 1 = CLOSED / OFF = 0 = OPEN].*

Option Switch Setup Table - 4-Position Switch

		SW1			
Switch Function	**Selections**	**1**	**2**	**3**	**4**
#1 Selects Mode ("PROG")	Flash Boot	ON			
	Normal Operation	OFF			
#2 Selects Printer ("OPT1")	Citizen		ON		
	Seiko		OFF		
#3 Selects Instrument ("OPT2")	3250			ON	
	4250			OFF	
#4 Not in Use ("OPT3")	N/A				ON
	N/A				OFF

NOTES:

1) ON = 1 = CLOSED
   OFF = 0 = OPEN
2) Seiko printers are used with Serial Suffix A - C; Citizen printers are used with Serial Suffix D and higher.
   Refer to Design Changes for additional information.

Cooling Assembly Replacement
3D3300R/4D3300R

Reference: Use this instruction with replacement part 3D3300R or 4D3300R.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver.

Warning-Hazardous Voltage

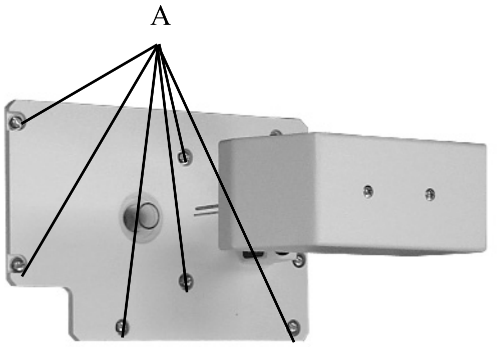
Warning-Internal components may be damaged by static electricity.

CAUTION: Improper tubing connections may result in fluid leakage and cause damage to the instrument.

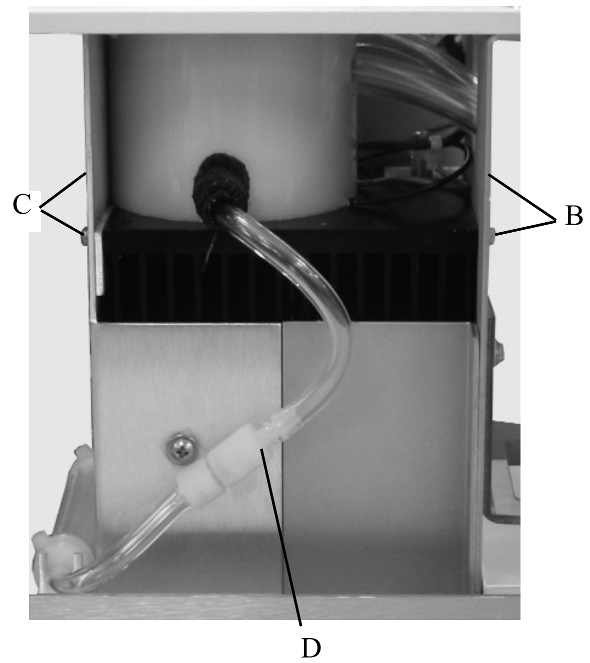
CAUTION The heat transfer liquid contains hazardous chemicals. Consult the material safety data sheet (MSDS) and use appropriate personal protective equipment.

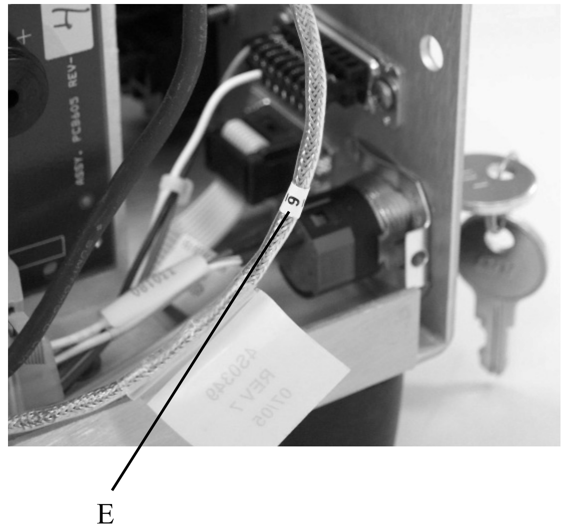
Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover, and remove the cover.
3. Remove the screws securing the instrument cover, and remove the cover.
4. Drain the system:
   a. Remove the heat transfer fluid bottle and empty the contents.
   b. Replace the empty bottle and insert the tubes.
   c. Press gently on the pump at the bottom of the head. Slide until all liquid has been expelled (the unit may need to be tipped on its side to remove the liquid).
5. Remove the deck and disconnect the pump (see below):
   a. Remove the six screws from the deck (A), and remove the deck.
   b. Remove the two screws that secure the bottle bracket to the cooling assembly (B).
   c. Remove the two screws that secure the pump bracket to the cooling assembly (C).
   d. Disconnect the hose from the pump mechanism (D).



6. Lift out the old cooling assembly and replace with the new one.
7. Note the new block probe bin number (E) located on the block probe cable.





8. Reassemble the instrument by reversing steps 1-5, making sure that there is no fluid leakage from the tubing connections.

9. Using the Setup Menu, adjust the block probe bin number, as needed. Recalibration will be required.

Cooling Fan Replacement
4D3360

Reference: Use this instruction to replace part 4D3360 Cooling Fan.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver.

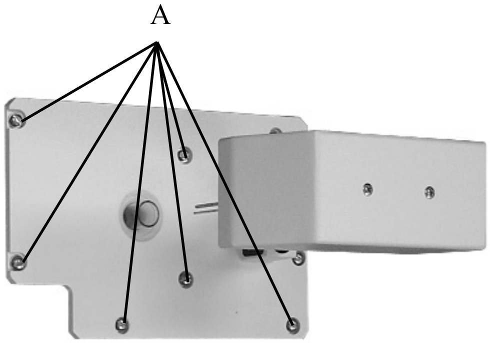
Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

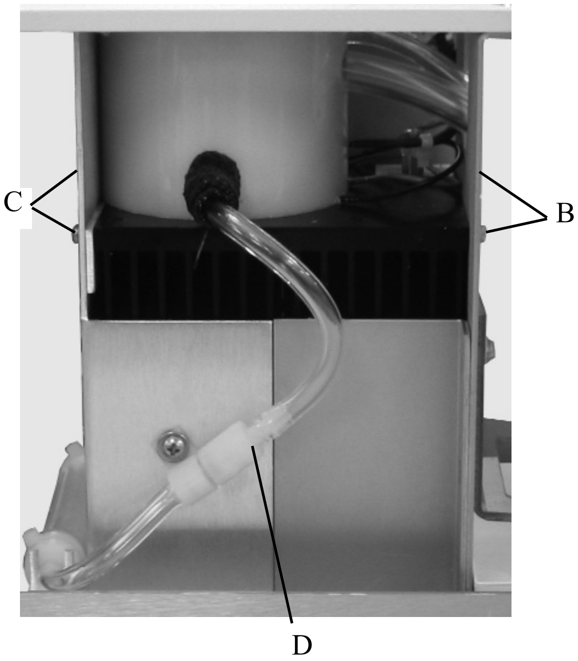
CAUTION: Improper connections may cause damage to the instrument.

Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover, and remove the cover.
3. Remove the screws and slide the instrument cover up and off.
4. Drain the system:
    a. Remove the heat transfer fluid bottle and empty the contents.
    b. Replace the empty bottle and insert the tubes.
    c. Press gently on the pump at the bottom of the head. Slide until all liquid has been expelled (the unit may need to be tipped on its side to remove the liquid).
5. Remove the six screws from the deck (A), and remove the deck.



6. Disconnect the pump (see below):
    a. Remove the two screws that secure the bottle bracket to the cooling assembly (B).
    b. Remove the two screws that secure the pump bracket to the cooling assembly (C).
    c. Disconnect the hose from the pump mechanism (D).



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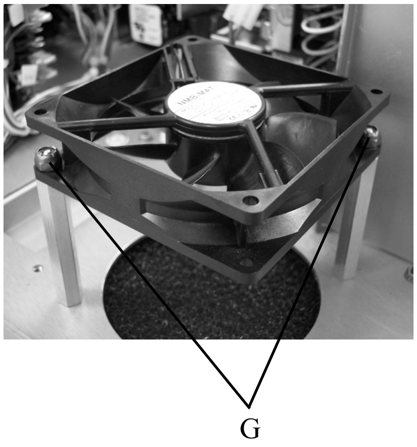
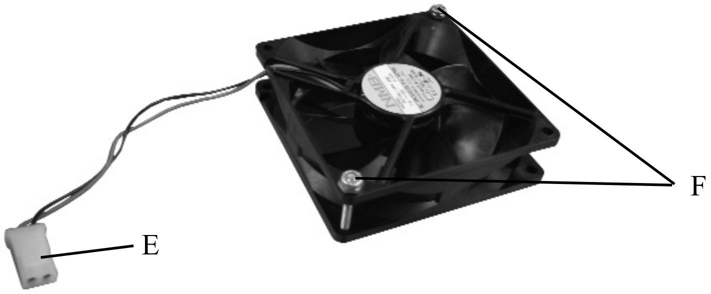
7. Unplug the thermoelectric connector and the block probe from the main control board.

8. Lift out the cooling assembly.

9. Unplug the fan connection (E) and remove the two nuts and washers from the fan (F or G).





10. Replace the old fan with the new one and reassemble the instrument by reversing steps 1-9.

Display Board Replacement
74051R/702041R

Reference: Use this instruction with replacement part 74051R or 702041R.

The 74051R replacement display board should be used only on Serial Suffix A - C.

The 702041R replacement display board should be used only on Serial Suffix D or higher.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, adjustable wrench, static grounding (earthing) wrist strap (included).

⚠ ***Warning-Hazardous Voltage***

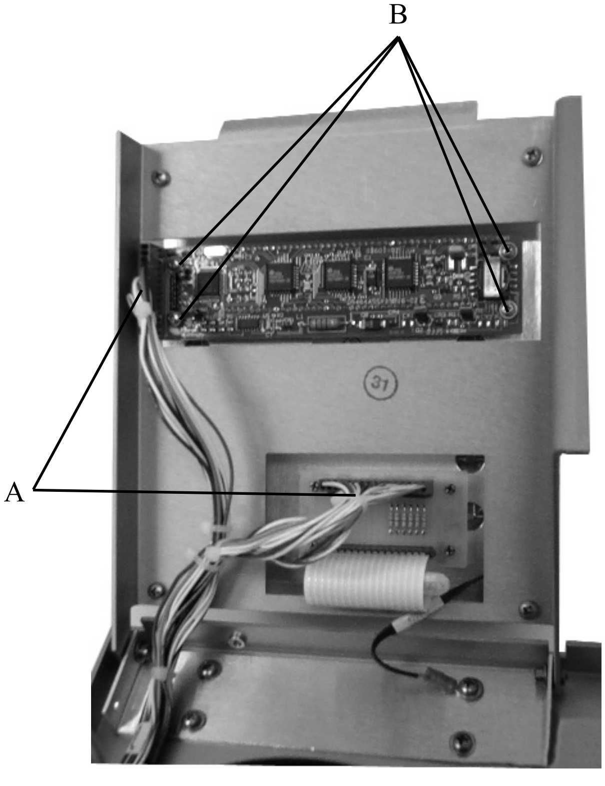
Warning-Internal components may be damaged by static electricity.

⚠ CAUTIONS:

- *Power cord must be disconnected to prevent electric shock.*
- *Never unpack, touch or handle any integrated circuit without wearing a grounding (earthing) strap to minimize your static charge.*

Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover, and remove the cover.
3. Remove the screws securing the instrument cover, and remove the cover.
4. Pull the keypad panel down.
5. Attach the static grounding strap to your wrist and stick the adhesive end to a suitable bare-metal ground, such as the rear panel.
6. Disconnect the keypad and display connectors (A) from the main harness.
7. Remove the four screws (B) that attach the display to the keypad, and remove the display.
8. Replace the old display board with the new one and reassemble by reversing steps 1-7.



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Driver Board Replacement
PCB523R

Reference: Use this instruction to install part PCB523R. This part should only be used with 3250/4250 instruments with serial suffix D or higher.

Tools Needed: Phillips screwdriver, small jeweler's flat-bladed screwdriver, static grounding (earthing) wrist strap (included).

Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

CAUTIONS:

- **POWER CORD MUST BE DISCONNECTED TO PREVENT ELECTRIC SHOCK.**
- **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE.**

Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover and remove the cover.
3. Release the printer cover, remove the screws securing the instrument cover, then slide the cover forward, then up and off to remove.
4. Locate the PCB523 driver board on the inside rear wall of the instrument.
5. Attach the static grounding strap to your wrist and stick the adhesive end to a suitable bare-metal ground, such as the rear panel.
6. Disconnect the five connectors (A) from the installed PCB, carefully noting the location of each to facilitate reconnecting to the replacement PCB. Note that the three connectors on the right side must have the latch released to disconnect.
7. Remove the two mounting screws (B), then remove the installed driver PCB.
8. Install the replacement driver PCB, secure with the mounting screws, then carefully reconnect the harnesses to the PCB, making sure to mate to the correct connector on the PCB.
9. Prior to reinstalling the instrument and head covers, test the replacement PCB as follows:
   a. Connect the power cord to the instrument, leave the printer cover released, then turn on the power.
   b. When the display shows PRESS START TO CONTINUE, press the **TEST** key on the keypad.
   c. Run the HEAD UP/DOWN TEST, listening to the sound of the motor. If the motor function seems noisy or is resonating, then adjust the potentiometer (C) on the driver PCB. Counterclockwise turns will increase the speed of the motor and should quiet the motor operation.

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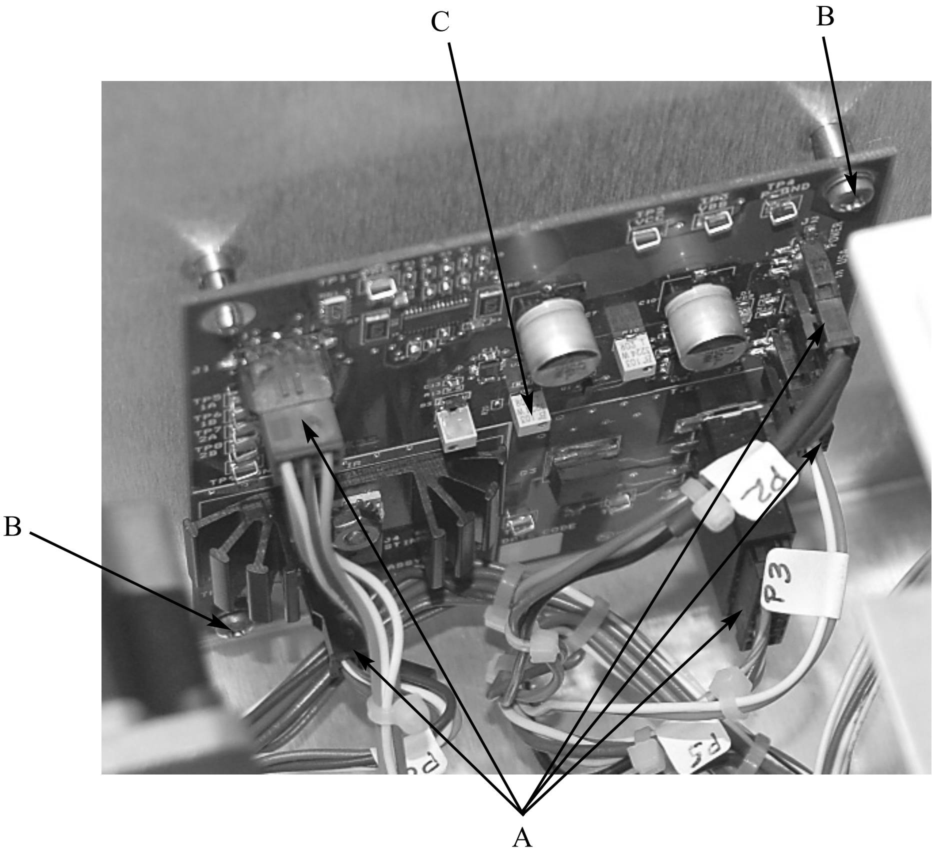
CAUTION: DANGEROUS VOLTAGE PRESENT. ONLY REACH IN FAR ENOUGH TO ADJUST THE POTENTIOMETER, AND AVOID TOUCHING OR CONTACTING ANY OTHER CIRCUIT ELEMENTS.

d. No other adjustments can be made directly to the driver board. Advanced Instruments recommends testing the remaining functions (stir wire driver and thermoelectric driver) after replacing the instrument covers.

e. Turn the power off, then unplug the instrument.

10. Replace the instrument cover, taking care to align the cover so that there is space on either side of the printer cover, then secure with the screws.

11. Replace the head cover, then secure with the screws.



Fuse Replacement
70011/70022

Reference: Use this instruction with replacement part 70011 (1.0-Amp) or 70022 (2.0-Amp).

Voltage/Position/Fuse:
100-130 250V 2.0-Amp time delay
200-250 250V 1.0-Amp time delay

Tools Needed: Flat-bladed screwdriver.

Warning-Hazardous Voltage

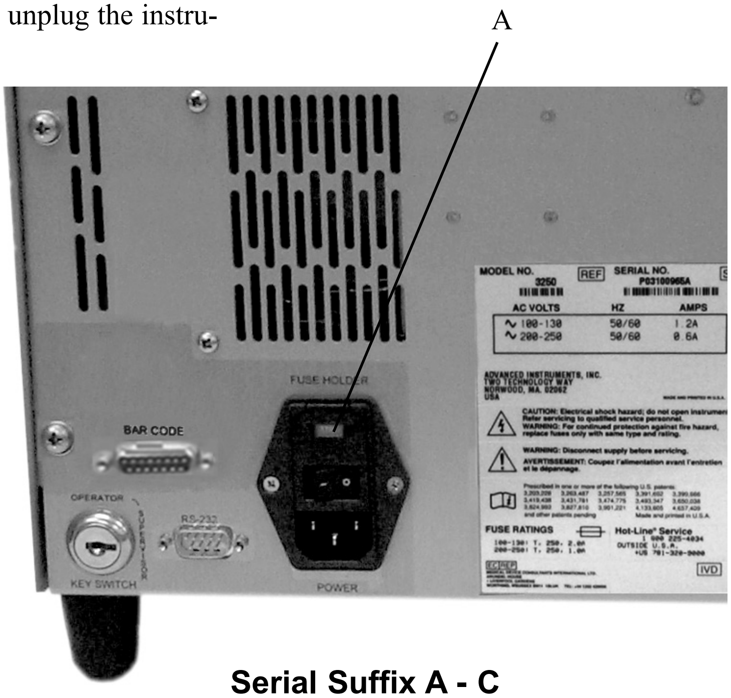
CAUTION: Improper connections may cause damage to the instrument.

Instructions:

Serial Suffix A - C

1. Turn off the power and unplug the instrument.
2. Use a flat-bladed screwdriver to pry open the fuse holder door and then the fuse holder module.
3. Dislodge the old fuses and reinstall the new fuses by placing them in the fuse holder brackets.
4. Place the fuse holder back into the instrument, with the correct voltage on the fuse holder showing in the window (A) on the fuse holder socket.
5. Close the fuse holder door.

If the AC voltage of the power outlet intended for the instrument is within the 100-130V range, the window should indicate 115V. If the power outlet AC voltage is within the 200-250V range, the window should indicate 230V.


A
FUSE HOLDER
BAR CODE
OPERATOR
SUPERVISOR
KEY SWITCH
RS-232
POWER
MODEL NO.
3250
SERIAL NO.
AC VOLTS
HZ
AMPS
100-130
50/60
1.2A
200-250
50/60
0.6A
ADVANCED INSTRUMENTS, INC.
TWO TECHNOLOGY WAY
NORWOOD, MA. 02062
USA
FUSE RATINGS
Hot-Line® Service

Serial Suffix A - C

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Serial Suffix D and Higher

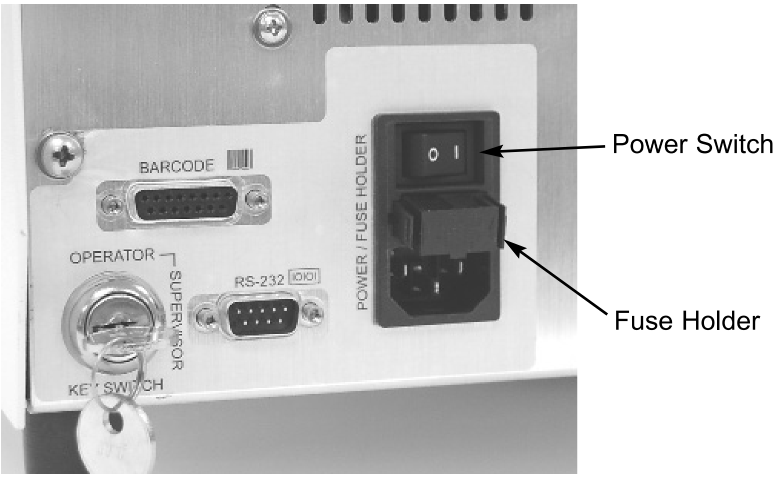
1. Switch the power switch to the off position and disconnect the power cord.

2. Use a small flat-bladed screwdriver or similar tool to remove the fuse holder door. Remove the fuse holder.

3. Double-check the values marked on the fuses. The Model 3250/4250 will automatically adjust for voltages between 100VAC and 250VAC, but appropriately rated fuses (2) must be installed. Use 5 x 20 mm, 250V, time delay (Type T): 2-Amp

4. Reinstall the fuse holder into the back of the instrument.

5. Reconnect the power cord and switch the power switch to the on position. The instrument should start up as normal.


Power Switch
Fuse Holder
BARCODE
POWER / FUSE HOLDER
OPERATOR
SUPERVISOR
RS-232
KEY SWITCH
O I

Serial Suffix D and Higher

Head Up Relay or Head Down Relay Replacement
3D3109

Reference: Use this instruction with replacement part 3D3109.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver.

⚠ ***Warning-Hazardous Voltage***

⚠ ***Warning-Internal components may be damaged by static electricity.***

⚠ **CAUTION:** Improper connections may cause damage to the instrument.

Note: *Serial Suffix A - C, only.*

Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover, and remove the cover.
3. Remove the screws securing the instrument cover, and remove the cover.
4. Locate the Head Up/Head Down Relay on the inside rear wall (Fig. 1). Note the wire colors and the corresponding connectors, and then remove the connectors.
5. Remove the screws (Fig. 1A) from the relay and remove the old relay.
6. Mount the PCB502 relay board (Fig. 2) onto the standoff studs and secure the board.

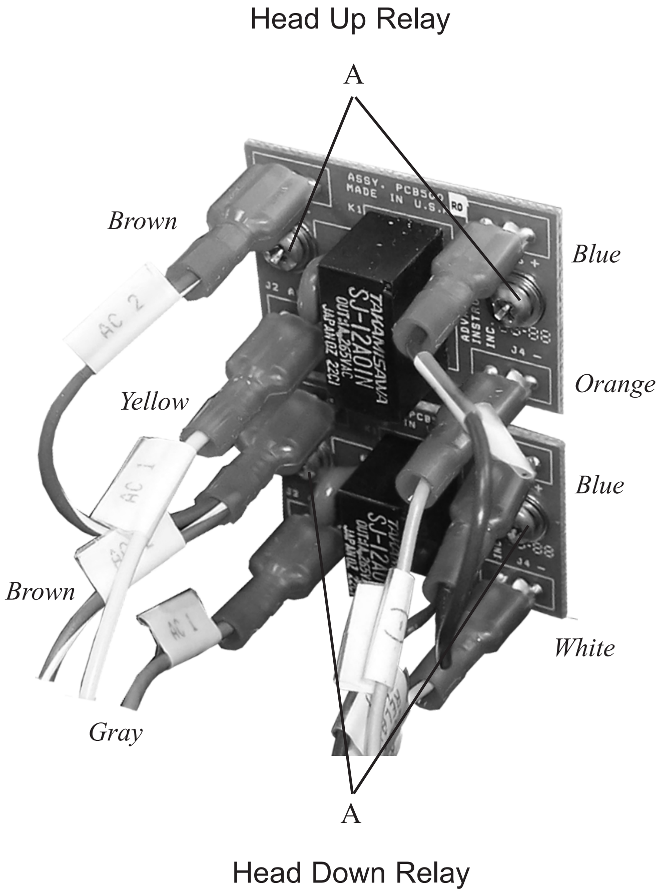


Figure 1

Note: *As of instrument serial suffix C, the single relay board PCB500 has been replaced by a dual relay board PCB502.*

7. K1 is the relay for moving the head up. Connect:

   Blue to J3
   Orange to J4
   Brown/white to J1
   Yellow to J2

8. K2 is the relay for moving the head down. Connect:

   Blue to J7
   White to J8
   Brown/white to J5
   Gray to J6

9. Reassemble by reversing steps 1-3.

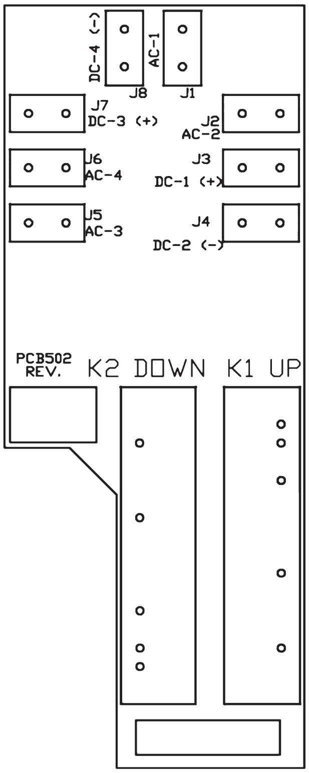

DC-4 (-)
J8
AC-1
J1
J7
DC-3 (+)
J2
AC-2
J6
AC-4
J3
DC-1 (+)
J5
AC-3
J4
DC-2 (-)
PCB502
REV.
K2 DOWN
K1 UP

Figure 2

Heat Transfer Fluid Pump Assembly Replacement
4D3690
Fluid Filter Replacement
4D3710R
One-way Check Valve Replacement
4D3705R or 99133R

Reference: Use this instruction with replacement parts 4D3690, 4D3710R, 4D3705R, or 99133R.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver.

⚠ ***Warning-Hazardous Voltage***

Warning-Internal components may be damaged by static electricity.

⚠ **CAUTION:** Improper tubing connections may result in fluid leakage and may cause damage to the instrument.

General Information:

Advanced Instruments, Inc. Models 3D3, 4D3, 3250, and 4250, and Fiske Associates Models Mark 2 and Mark 3 osmometers and cryoscopes use a closed-loop circulation system for the heat transfer fluid in the cooling system. Various design modifications to the Pump Assembly affect the part replacement instructions. Please turn to the appropriate section listed in the table of contents, based upon the part being replaced and the model instrument that is being serviced.

Instruments shipped prior to 1996 have a cooling assembly inlet tube with a much smaller diameter. A tubing adapter has been provided in the 4D3690 kit to allow easy connection to this smaller tube.

Instruments shipped prior to 2004 use the same type of one-way check valve (4D3705R) in two places. One is located next to the Fluid Filter on the pump intake in the Heat Transfer Fluid bottle. The other is located at the outlet end of the Pump Assembly attached to the inlet of the Cooling Assembly. Effective in 2004, the one-way check valve

Table of Contents

Replacement Part	Model	Page
Heat Transfer Fluid Pump Assembly (4D3690)	3D3, Mark 3, 4D3, Mark 2	2
Heat Transfer Fluid Pump Assembly (4D3690)	3250, 4250	4
Fluid Filter (4D3710R)	All	5
Bottle One-way Check Valve (4D3705R)	All	5
Cooling System Inlet One-way Check Valve (99133R)	All	6

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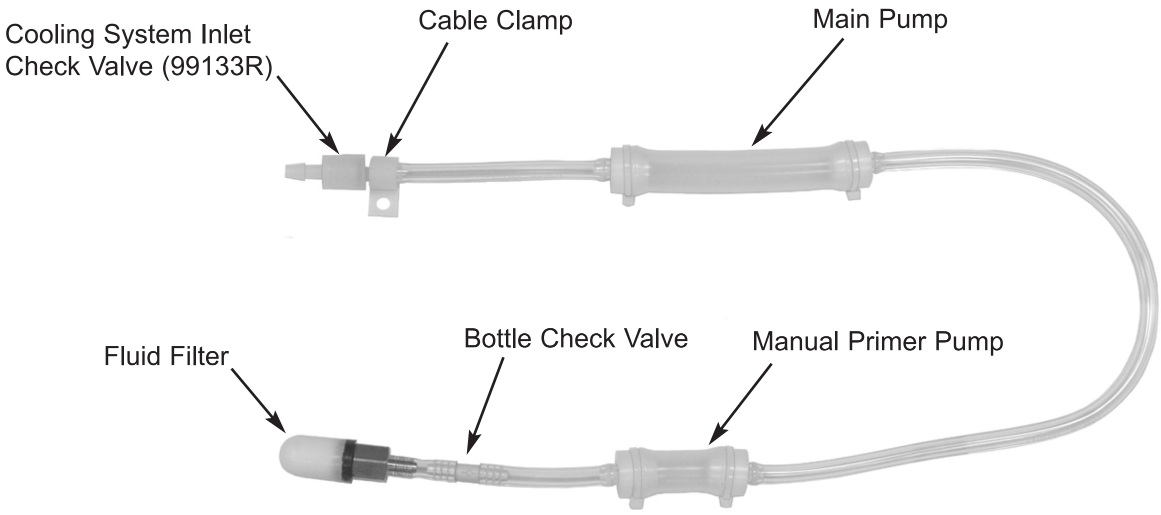


4D3690 Pump Assembly

Figure 1

attached to the Cooling Assembly inlet has been changed to a different, larger check valve (99133R) to improve instrument performance and reliability.

Figure 1 shows the current 4D3690 Pump Assembly with the various components labeled.

⚠ **CAUTION:** The heat transfer fluid contains hazardous chemicals. Consult the material safety data sheet (MSDS) and use appropriate personal protective equipment.

4D3690 Heat Transfer Fluid Pump Assembly Replacement

Models 3D3 and Mark 3 Osmometers
Models 4D3 and Mark 2 Cryoscopes

Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the instrument cover, and remove the cover (see below):

   The following instructions refer to 4D3 cryoscopes without a suffix:

   a. Remove the heat transfer fluid from the front cover.

   b. Remove the two screws from the rear panel of the back cover and lift off the back cover.

   c. Remove the four screws from underneath the front cover, lift the front cover slightly up, and then slide it forward and off.

   The following instructions refer to 4D3 cryoscopes with suffix "A" or later, and to all 3D3 osmometers:

   a. Remove the two sets of screws from the side panels and the two screws from the rear panel.

   b. Slide the instrument cover up and off.

3. Drain the system:
    a. Remove the heat transfer fluid bottle and empty the contents.
    b. Replace the empty bottle and insert the tubes.
    c. Press and release gently on the pump (A) at the rear of the cooling assembly (see Figure 2). Continue until all liquid has been expelled.

4. If present, remove the screw holding the cable clamp (B) to the cooling system shroud (see Figure 2). Firmly gripping the cooling system inlet tube (C), remove the check valve, disconnecting the pump from the cooling assembly.

5. Remove the pump (A) from the bracket (D).

6. Feed the fluid filter end of the pump assembly up and around the cooling system support brackets, and remove the pump assembly.

7. Replace the old assembly with the new one.
    a. **If the instrument is a 3D3 or Mark 3 osmometer and the Spacer Strip is not present**, remove the green liner and install the Spacer Strip as shown in Figure 3. This will ensure that the proper amount of heat transfer liquid is pumped during each cycle.
    b. Proceed with the installation of the new pump assembly by reversing steps 1-4, making sure to use the cable clamp already installed on the new pump assembly. Note the orientation of the cable clamp (see Figure 4).
    c. Note that just above the heat transfer fluid bottle, a small priming pump has been added to assist with priming and emptying the pump assembly. This should be positioned as shown in Figure 6.
    d. Make sure that there is no fluid leakage from the tubing connections.

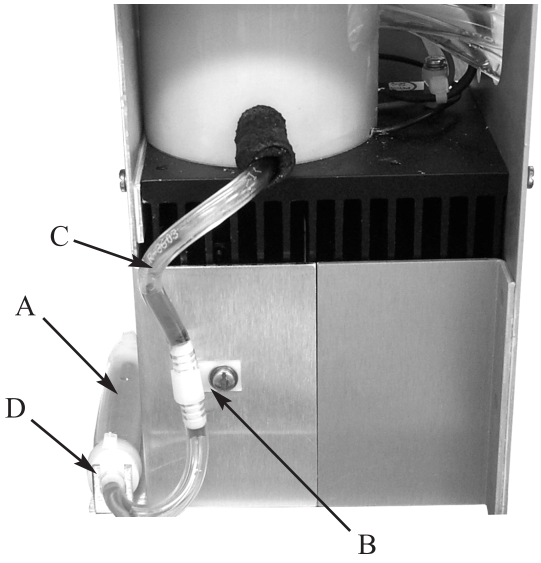


Figure 2

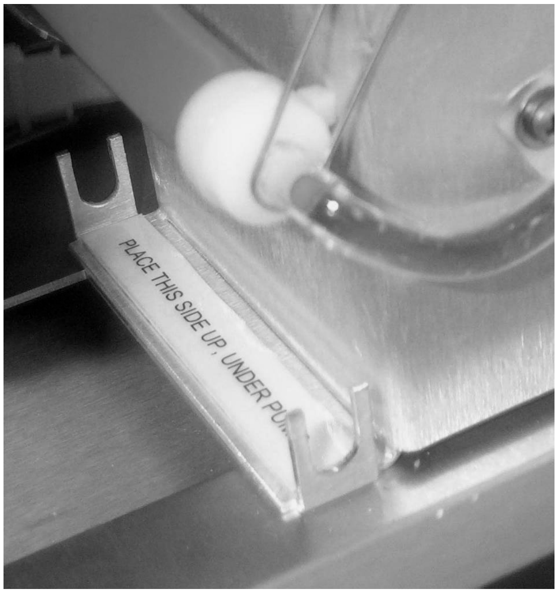


Figure 3

4D3690 Heat Transfer Fluid Pump Assembly Replacement

Model 3250 Osmometers
Model 4250 Cryoscopes

Instruction:

1. Turn off the power and unplug the instrument.

2. Remove the screws securing the instrument cover, and remove the cover:

3. Drain the system:
   a. Remove the heat transfer fluid bottle and empty the contents.
   b. Replace the empty bottle and insert the tubes.
   c. Press and release gently on the pump (E) at the rear of the cooling assembly (see Figure 5). Continue until all liquid has been expelled.

4. Remove the screw holding the cable clamp (F) to the cooling system shroud (see Figure 5). Firmly gripping the cooling system inlet tube (G), remove the check valve, disconnecting the pump from the cooling assembly.

5. Remove the pump (E) from the bracket (H).

6. Feed the fluid filter end of the pump assembly up and around the cooling system support brackets, and remove the pump assembly.

7. Replace the old assembly with the new one.
   a. Proceed with the installation of the new pump assembly by reversing steps 1-4, making sure to use the cable clamp already installed on the new pump assembly. Note the orientation of the cable clamp (see Figure 4).

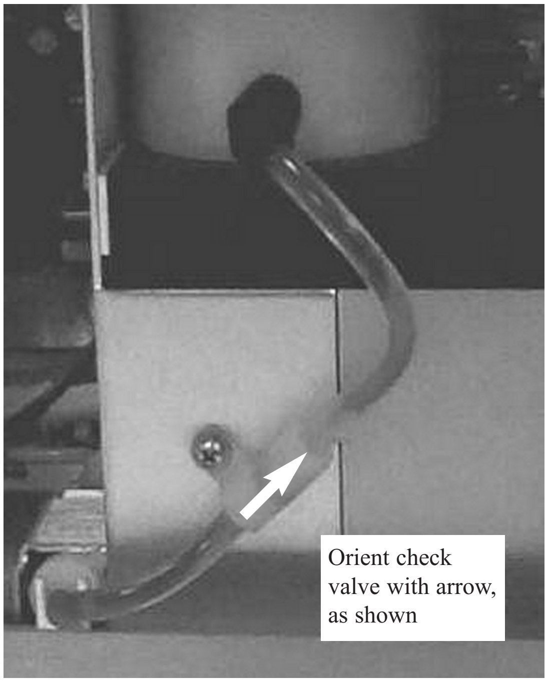


Figure 4

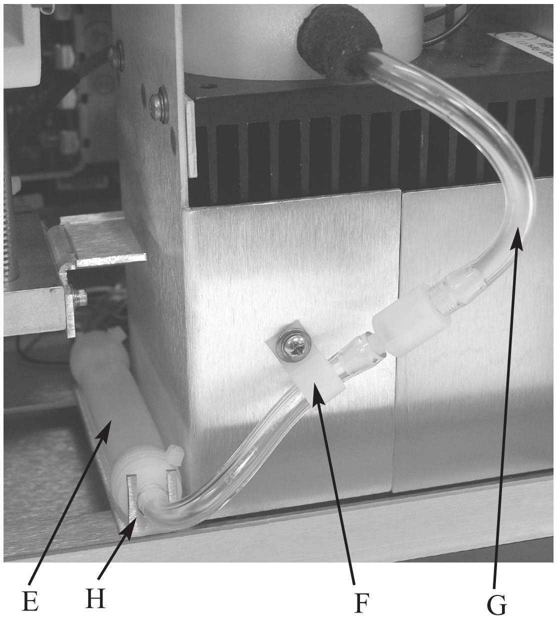


Figure 5

b. Make sure that there is no leakage from the tubing connections.

4D3710R Fluid Filter Replacement

Note: The instrument cover does not need to be removed to replace this part.

Instruction:

1. Open the heat transfer fluid compartment door.

2. Remove the tube with filter attached from the bottle of heat transfer fluid (Figure 6). Use a paper towel or absorbent cloth to soak up excess heat transfer fluid.

3. Unscrew the old filter (I) from the pump tubing.

4. Replace the old filter with the new one, and then replace the tube into the heat transfer fluid bottle.

4D3705R Bottle One-way Check Valve Replacement

Note: The instrument cover does not need to be removed to replace this part.

Instruction:

1. Open the heat transfer fluid compartment door.

2. Remove the tube with filter attached from the bottle of heat transfer fluid (Figure 6). Use a paper towel or absorbent cloth to soak up excess heat transfer fluid.

3. Holding the tube in an elevated position to minimize leakage, firmly grip the tube just above the old check valve, then pull off the old check valve and filter.

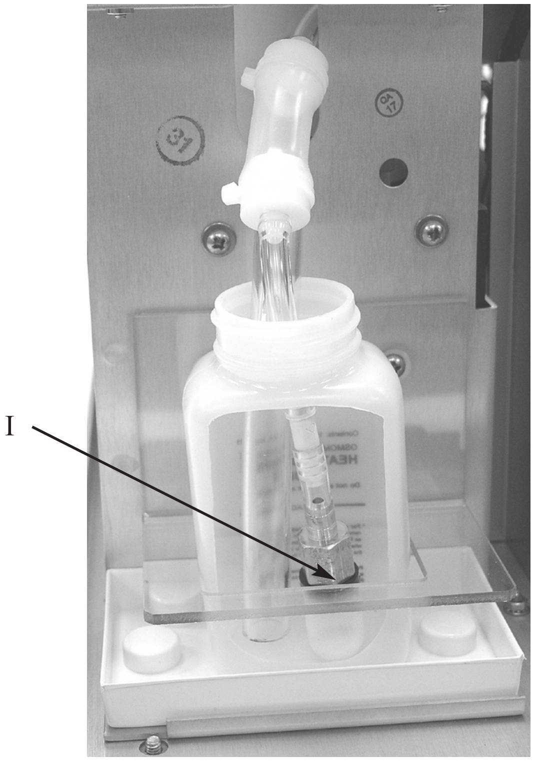


Figure 6

4. Immediately insert the new check valve, making sure to orient the check valve properly (Figure 7).

5. Remove the old check valve from the short piece of tube that connects it to the filter, then reattach the tube and filter to the new check valve. Replace the tube with filter into the heat transfer fluid bottle.

99133R Cooling System Inlet One-way Check Valve Replacement

Instruction:

1. Turn off the power and unplug the instrument.

2. Remove the screws securing the instrument cover, and remove the cover (see below):

   The following instructions refer to 4D3 cryoscopes without a suffix:

   a. Remove the heat transfer fluid from the front cover.
   b. Remove the two screws from the rear panel of the back cover and lift off the back cover.
   c. Remove the four screws from underneath the front cover, lift the front cover slightly up, and then slide it forward and off.

   The following instructions refer to 4D3 cryoscopes with suffix "A" or later, and to all 3D3 osmometers:

   a. Remove the two sets of screws from the side panels and the two screws from the rear panel.
   b. Slide the instrument cover up and off.

   The following instructions refer to 4250 cryoscopes and 3250 osmometers:

   a. Remove the two sets of screws from the side panels and the four screws from the rear panel.
   b. Lift and tilt the cover so that the rectangular opening clears the front of the head cover first, then move the instrument cover back, up and off.

3. If present, remove and save the screw holding the cable clamp (B or F) to the cooling system shroud (see Figure 2 or Figure 5). Firmly gripping the pump assembly outlet tube, remove the check valve.

4. If needed, slip the new cable clamp onto the pump assembly outlet tube.

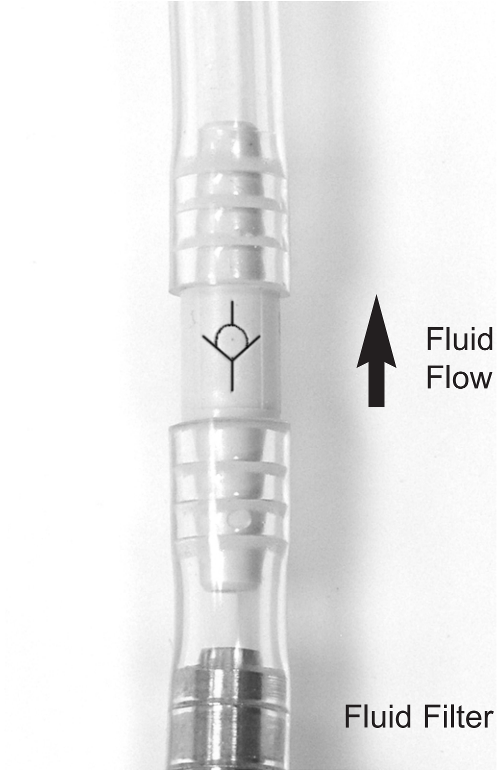


Figure 7

5. Firmly grip the cooling assembly inlet tube and remove the check valve. Discard the old check valve and cable clamp.

6. Install the new check valve, making sure to orient the check valve properly (see Figure 4). Connect the new check valve to the cooling system inlet tube, then fasten the new cable clamp using the hardware saved in step 3.

   On instruments shipped prior to 1996, the cooling assembly inlet tube was a much smaller diameter. A tubing adapter has been provided in the 99133R kit to allow easy connection to this smaller tube.

7. With the heat transfer pump assembly inlet and outlet tubes inserted into a bottle of heat transfer fluid, gently press the pump a few times to purge any trapped

air and to check the proper functioning of the heat transfer pump assembly.

Make sure that there is no fluid leakage from the tubing connections.

8. Replace the instrument cover.

Keypad Replacement
325511R

Reference: Use this instruction with replacement part 325511R.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, adjustable wrench, static grounding (earthing) wrist strap (included).

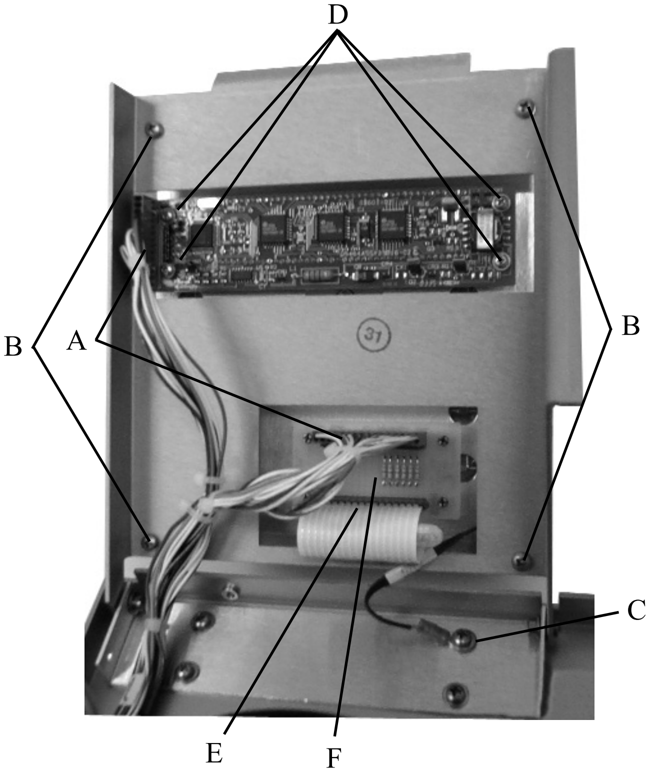
Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity. A static grounding wrist strap must be worn during this replacement procedure.

CAUTION: Improper connections may cause damage to the instrument.

Instruction:

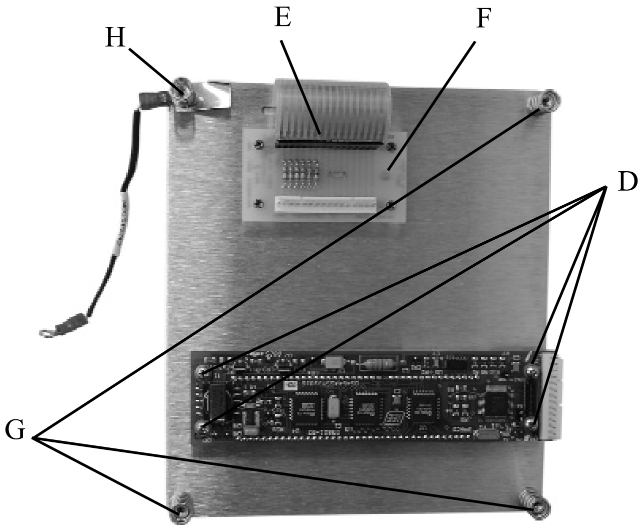
1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover, and remove the cover.
3. Remove the screws securing the instrument cover, and remove the cover.
4. Pull the keypad panel down.
5. Disconnect the keypad and display harness connectors (A).
6. Remove the four screws that attach the keypad to the keypad support bracket (B).
7. Remove the bracket mounting screw that attaches the ground strap from the keypad to the chassis (C).



8. Remove the partially disassembled keypad from the instrument.
9. Remove the four screws (D) that attach the display to the keypad, remove the display, then mount the display onto the replacement keypad.
10. Disconnect the keypad flex cable (E) from the keypad interface board (F). Remove the keypad interface board, then install onto the replacement keypad. Connect the keypad flex cable from the replacement keypad to the keypad interface board.
11. Remove the spring, standoff, and washer (G) from three corners of the keypad as

shown, then reinstall them onto the replacement keypad.

12. Remove the spring, standoff, and ground strap (H) from the keypad as shown, then reinstall onto the replacement keypad making sure to attach the keypad ground under the ground strap and standoff.
13. Install the assembled replacement keypad assembly to the keypad support bracket using the four screws removed in step 6.
14. Connect the ground strap using the bracket mounting screw removed in step 7.
15. Connect the keypad and display harness connectors (A).
16. Return the keypad to its normal, installed position. Replace the instrument and head covers, and restore power to the instrument.



Load Resistor Replacement Instruction

(Models 4D3, 3D3, Mark 2, Mark 3, 3250, and 4250)

Reference: Use this instruction to install part 425150R.

For Use On Models:
4D3 with Serial Suffix N or later
3D3 with Serial Suffix L or later
MK2 with Serial Suffix G or later
MK3 with Serial Suffix E or later
3250 -- All
4250 -- All

Tools Needed: Small Phillips screwdriver.

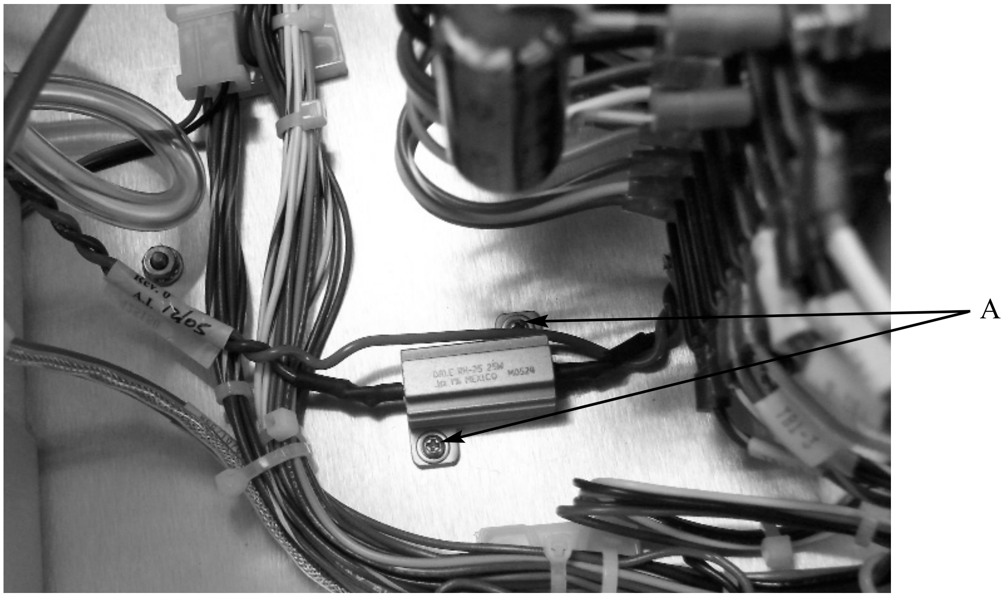
⚠ ***Warning-Hazardous Voltage***

Warning-Internal components may be damaged by static electricity.

Instruction:

1. Turn off the instrument power and disconnect the power cord.
2. Remove the instrument cover.
3. Pull and drop the keypad and display forward.
4. Looking down from above onto the chassis, locate the load resistor as shown in the photograph. In older models, it is located behind the keypad assembly and to the right of the cooling assembly. In some older models, the load resistor will not be present, but the mounting holes will still be present. In 3250/4250 Serial Suffix D or later, it will be located towards the rear of the instrument, behind the cooling assembly.

   a. **With no load resistor present**: Install the 425150 load resistor assembly using #2 x 3/8 screws (A) provided, sa shown in the photo. Disconnect hte cooling assembly red and black wired connector from the main harness, then plug those connectors into the mating



connectors from the 425150 load resistor assembly.

   b. **With load resistor present, in either location**:
   Unplug the existing load resistor connectors, remove the mounting screws, then remove the existing load resistor assembly, Install the new 425150 load resistor assembly and reconnect to the mating connectors of the main harness and cooling assembly.

5. Replace the instrument cover and restore power.

6. Verify correct operation using the “**A/D Test**” in TEST utilities.

Mandrel Replacement
3LH500

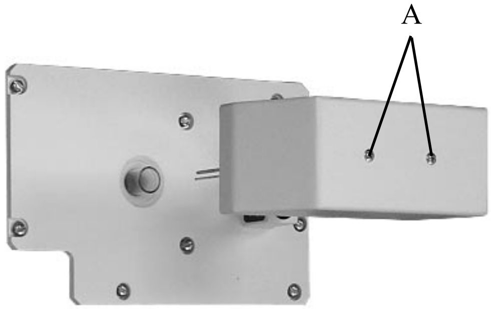
Reference: Use this instruction with replacement part 3LH500.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, 1/16” Allen wrench, probe alignment tool and instructions (included).

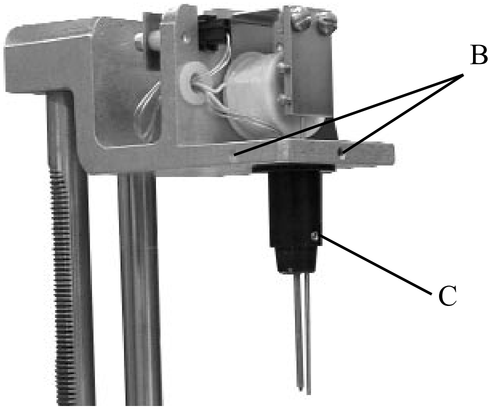
CAUTION: Improper connections may cause damage to the instrument.

Instruction:

1. Turn off the power and unplug the instrument.



2. Remove the two screws from the head cover (A) and lift off the head cover.
3. Loosen the two mandrel setscrews (B) and the probe setscrew (C).
4. Hold the probe gently while pulling the mandrel down past the probe and off.
5. Carefully, push the new mandrel up past the probe and into position on the flange.



6. Seat the mandrel firmly up into the mandrel hole, with the stir/freeze wire channel perpendicular to the front edge of the chassis and no gaps between the flange and the underside of the chassis.
7. Without overtightening (*overtightening can damage the mandrel*), re-tighten the two mandrel setscrews to hold the mandrel in place.
8. Use the probe alignment tool and instructions to properly position the probe and stir/freeze wire.
9. When the probe is in the position required, tighten the probe setscrew just enough to firmly hold the probe, but not crack or distort the thin plastic wall of the mandrel.
10. Arrange the probe leads so that they will not touch the clapper or be pinched by the head cover, and replace the cover.
11. Plug in the power cord and return the instrument to operation.

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Motor Assembly Replacement
4D3350R/325304R

Reference: Use this instruction with replacement part 4D3350R or 325304R.

Use 4D3350R with Models 3250/4250 Serial Suffix A - C, 3D3, 4D3, Mark 2, or Mark 3.

Use 325304R with Models 3250/4250 Serial Suffix D or higher.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, 1/16” & 9/64” Allen wrenches

Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

CAUTION: Improper connections may cause damage to the instrument.

4D3350R Instruction:

Refer to Figures 1 and 2.

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the instrument cover, and remove the cover.
3. Place an empty sample tube in the sample well, then push the head down.
4. Disconnect the three motor connectors (A) from the capacitor and harness, noting the color and location of each connection.

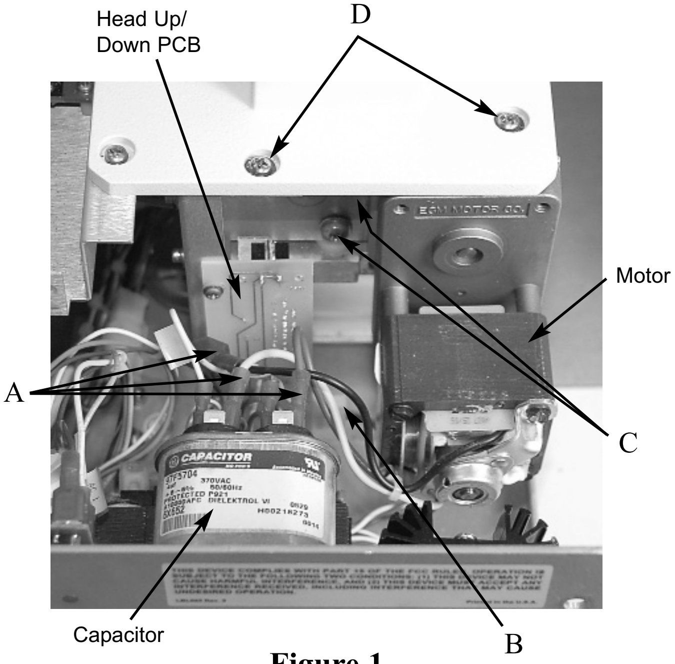


Figure 1

5. Disconnect the harness connected to the bottom of the Head Up/Down PCB (B).
6. Remove the motor assembly mounting screws (C) below the deck. A short or right-angle screwdriver may help to access these screws.
7. Remove the motor assembly mounting screws (D) through the top surface of the deck, then lift the motor assembly out of the instrument and place on a flat, clean surface near the instrument.
8. Measure the space between the plastic gear on the clutch assembly to the surface of the motor mounting bracket so that it can be replaced in the same location on the replacement motor. Using the 1/16” Allen wrench, remove the two Allen setscrews (E) that secure the clutch assembly to the motor shaft, then remove

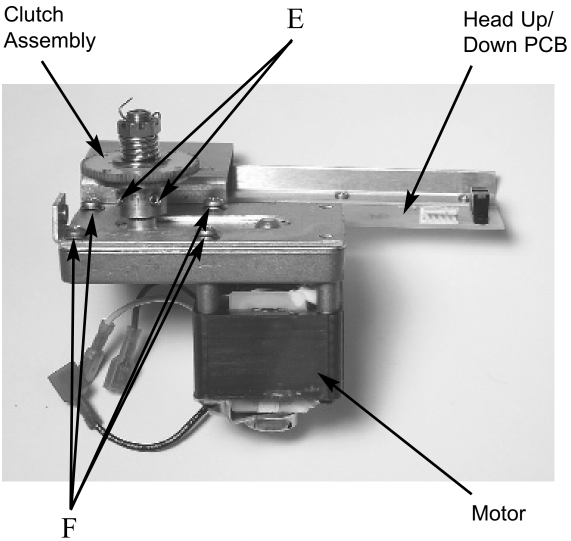


Figure 2

the clutch assembly. If necessary, use a screwdriver to gently pry the clutch assembly from the shaft.

9. Remove the four screws (F) that secure the motor to the bracket, and remove the motor.

10. Assemble the replacement motor to the motor mounting bracket using the four screws (F).

11. Slide the clutch assembly onto the replacement motor shaft and tighten the two Allen setscrews, making sure to locate the clutch assembly per the measurement taken in Step 8.

12. Install the motor assembly into the instrument using the two screws (D) through the surface of the deck. Make sure the teeth of the plastic gear are properly meshed with the gear rack on the sample head shaft, and the motor mounting bracket is pressed firmly against the lower back surface of the deck casting. Tighten the two screws.

13. Install and tighten the two motor assembly mounting screws (C) below the deck.

14. Reconnect the three motor connectors (A), making sure to reconnect in the same configuration as noted in Step 4.

15. Reconnect the harness to the connector at the bottom of the Head Up/Down PCB (B).

16. Replace the instrument cover, then secure in place using the mounting screws.

325304R Instruction:

Refer to Figures 3, 4 and 5.

1. Turn off the power and unplug the instrument.

2. Remove the screws securing the instrument cover, and remove the cover.

3. Place an empty sample tube in the sample well, then push the head down.

4. Disconnect the motor connector (G) from the driver PCB located on the inside rear of the instrument.

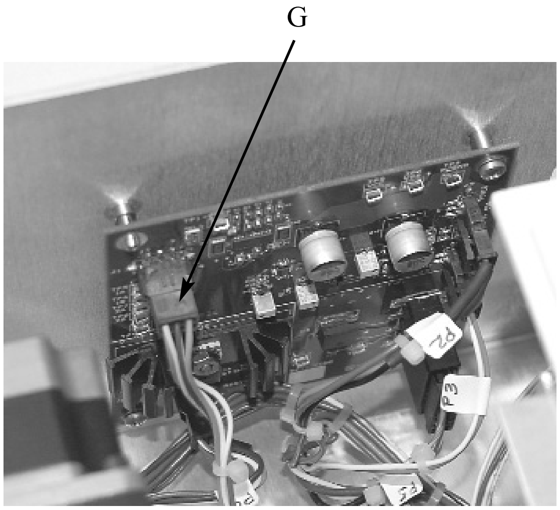


Figure 3

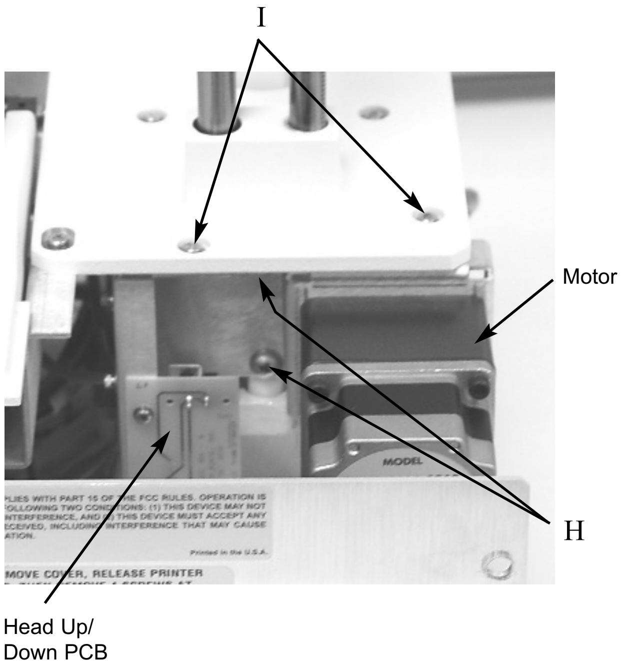


Figure 4

5. Disconnect the harness connected to the bottom of the Head Up/Down PCB (not shown).

6. Remove the motor assembly mounting screws (H) below the deck. A short or right-angle screwdriver may help to access these screws.

7. Remove the motor assembly mounting screws (I) through the top surface of the deck, then lift the motor assembly out of the instrument and place on a flat, clean surface near the instrument.

8. Measure the space between the plastic gear on the clutch assembly to the surface of the motor mounting bracket so that it can be replaced in the same location on the replacement motor. Using the 1/16" Allen wrench, remove the two Allen setscrews (J) that secure the clutch assembly to the motor shaft, then remove the clutch assembly. If necessary, use a screwdriver to gently pry the clutch assembly from the shaft.

9. Using the 9/64" Allen wrench, remove the four screws (K) that secure the motor to the bracket, and remove the motor.

10. Assemble the replacement motor to the motor mounting bracket using the four screws (K).

11. Slide the clutch assembly onto the replacement motor shaft and tighten the two Allen setscrews, making sure to locate the clutch assembly per the measurement taken in Step 8.

12. Install the motor assembly into the instrument using the two screws (I) through the surface of the deck. Make sure the teeth of the plastic gear are properly meshed with the gear rack on the sample head shaft, and the motor mounting bracket is pressed firmly against the lower back surface of the deck casting. Tighten the two screws.

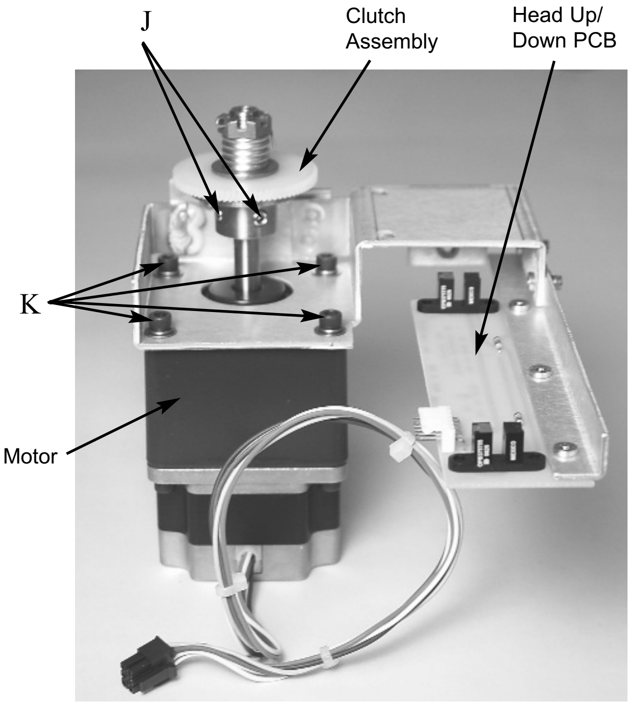


Figure 5

13. Install and tighten the two motor assembly mounting screws (H) below the deck.

14. Reconnect the motor harness (G) to the driver PCB.

15. Reconnect the harness to the connector at the bottom of the Head Up/Down PCB.

16. Replace the instrument cover, then secure in place using the mounting screws.

NVRAM Battery Replacement
71027R

Reference: Use this instruction with:
Advanced Instruments Inc.
- 4250 Cryoscopes
- 3250 Osmometers
- 3320 Osmometers
- 2020 Osmometers
- 4-digit year Model 3300 Osmometers
- Intel-based 3D3 Osmometers
- Intel-based 4D3 Cryoscopes

Fiske Associates
- 210 Osmometers
- Intel-based MK-3 Osmometers
- Intel-based MK-2 Cryoscopes

Tools Needed: Small flat-bladed screwdriver, static grounding (earthing) wrist strap (included).

CAUTION: Unplug the power cord prior to opening or removing covers, or else you may be exposed to electric shock, excessive temperatures, or mechanical hazards.

Performing this service or maintenance should only be done by a qualified service technician.

A discharge of static electricity from contact with the human body or other conductor may damage system boards or static sensitive devices. Never perform internal maintenance without following recommended static protection procedures.

Instruction:

1. Turn off the instrument power and remove the power cord from the rear of the instrument.

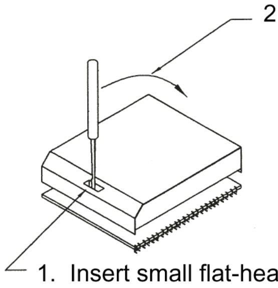
2. Open the instrument cover.

3. Attach the static grounding strap according to the instructions on its packaging.

4. Locate the processor Printed Circuit Board (PCB120, PCB125, PCB620, 200016PC, or 210102PC) and the NVRAM chip:
   - If using PCB120, locate U14.
   - If using PCB125 locate U13.
   - If using PCB620, remove the processor board from the application board and locate U15 on the back side.
   - If using 200016PC, locate U11.
   - If using 210102PC, locate U11.

5. Once you have located the NVRAM chip, locate the small notch and insert the small screwdriver, as described in figure 1.

POWERCAP REMOVAL



2. Pull back screwdriver handle slowly until slot side of powercap releases from module base.

1. Insert small flat-headed screwdriver vertically into powercap slot.

Figure 1

For additional information or technical assistance, please contact Advanced Instruments Hot-Line® Service Center. (U.S. 1-800-225-4034, outside North America +US 1-781-320-9000. After normal business hours, dial extension 2191.)

6. Remove the cover (powercap) and set it aside.

7. Remove the replacement powercap from the anti-static bag and install it on the component base, as described in figure 2.

8. Reinstall the processor board, if removed.

9. Restore power to the instrument and verify correct power-up sequence without any LOW BATTERY warnings.

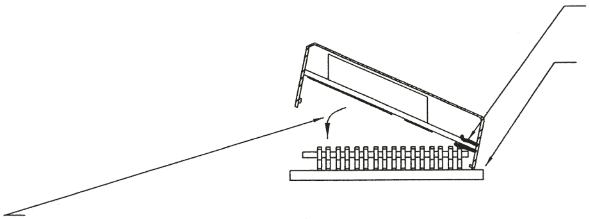
10. Set the date and time, following the instructions in the user's guide.

11. Turn off the power and wait ten minutes. Turn the instrument back on and verify that the correct time has been maintained.

12. Turn off the power and restore the instrument cover.

13. Reset all stored parameters (e.g., block and sample bin numbers, plateau modes, etc.) and recalibrate the instrument.

POWERCAP ATTACHMENT



1. Align powercap contact springs with module base contact lands.
2. Hook powercap flange under module base board. Fit alignment notches in module base board.
3. Push down slot side of powercap until snaps onto module base.

Figure 2

Power Supply Assembly Replacement
4D3950/325950R

Reference: Use this instruction with replacement part 4D3950 or 325950R.

Use 4D3950 with Models 3250/4250 Serial Suffix A - C, 3D3, 4D3, Mark 2, or Mark 3.

Use 325950R with Models 3250/4250 Serial Suffix D or higher.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, static grounding (earthing) wrist strap (included).

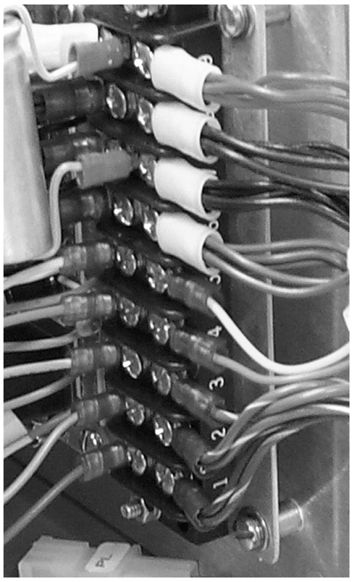
Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

CAUTION: Improper connections may cause damage to the instrument.

4D3950 Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover, and remove the cover.
3. Remove the screws securing the instrument cover, and remove the cover.
4. The power supply is mounted on the vertical mounting panel behind the main printed circuit boards. Remove the two rear screws and the two bottom screws securing the power supply mounting panel and lift the entire assembly out far enough to access the power supply.
5. Identify and disconnect the wiring harness connections from the power supply terminal strip. Note the wire colors and the corresponding connectors.
6. Remove the four screws and nylon washers from the power supply board.
7. Replace the old power supply with the new one and reassemble by reversing steps 1-6.



325950R Instruction:

1. Turn off the power and unplug the instrument.

CAUTION: IT IS CRITICAL THAT THE INSTRUMENT BE UNPOWERED THROUGHOUT THIS REPLACEMENT PROCEDURE. ALWAYS UNPLUG THE INSTRUMENT FOR PERSONAL PROTECTION

For additional information or technical assistance, please contact Advanced Instruments Hot-Line® Service Center (U.S. 1-800-225-4034, outside North America +US 1-781-320-9000).

FROM HAZARDOUS VOLTAGES AND TO PREVENT POTENTIAL DAMAGE TO THE INSTRUMENT.

2. Remove the screws securing the head cover, and remove the cover.

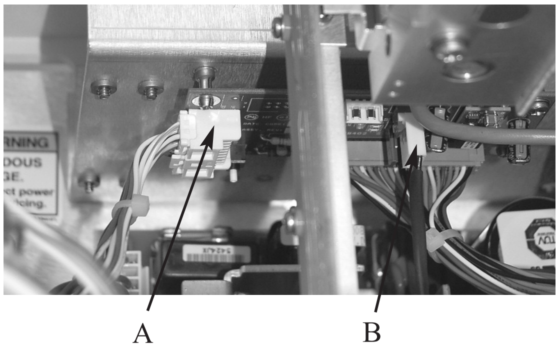
3. Release the printer cover. Remove the screws securing the instrument cover, then slide the cover forward, then up and off to remove. Tilt the keypad forward to provide access and clearance to the printer assembly. Remove the installed paper roll from the paper assembly.

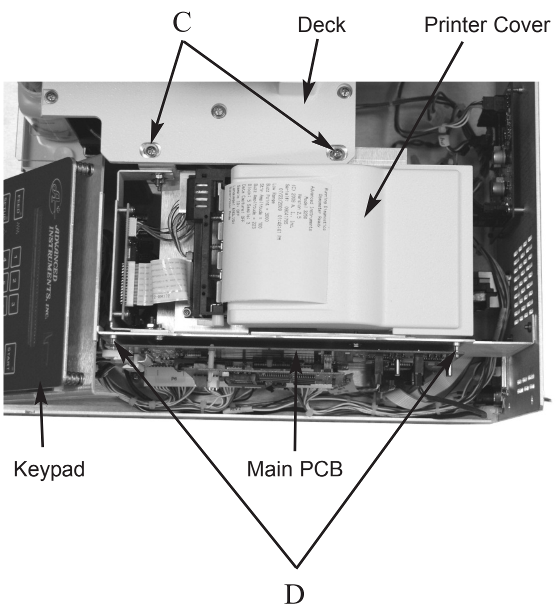
4. Locate and remove the printer assembly mounted between the deck and the main PCB support to provide access to the power supply.

    a. Attach the static grounding strap to your wrist and stick the adhesive end to a suitable bare-metal ground, such as the rear panel.

    b. Release cable end latch and disconnect the printer data cable (A) attached at the lower rear of the printer assembly, then disconnect the printer power connection (B) located in the middle side of the printer interface PCB, towards the sample cooling assembly and head.

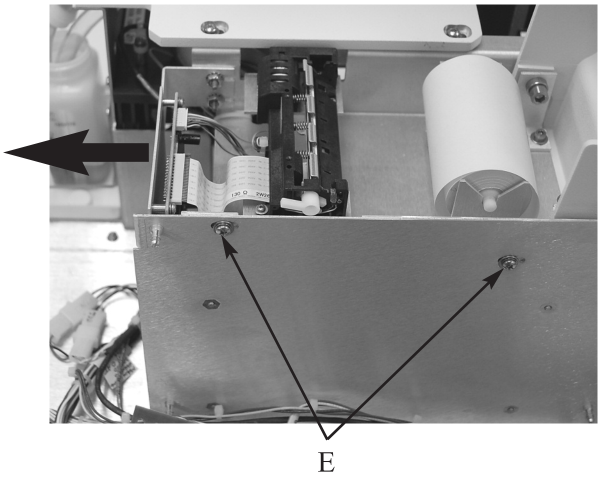
    c. Remove the two mounting screws (C) that attach the printer bracket to the deck.

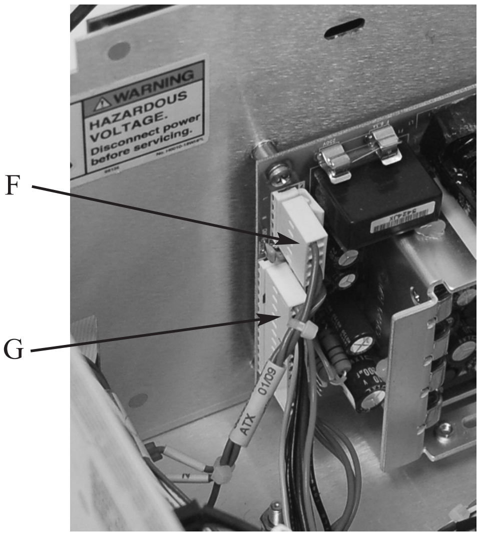




    d. Release the main PCB from the standoffs (D). Some instruments may require two screws be removed. Tilt the main PCB away from the mounting bracket. Note the front-to-back position of the mounting screws (E) that attach the printer bracket to the main PCB mounting bracket to assist during reassembly, then remove the two mounting screws.

    e. To remove the printer assembly, slide the printer assembly towards the front of the instrument until the printer bracket is clear of the deck.

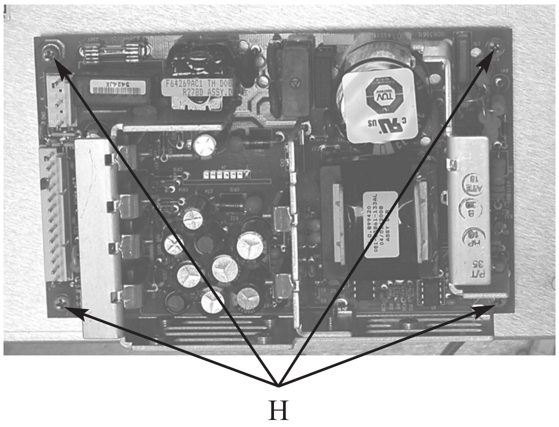




5. Disconnect the AC power harness (F) and the main harness DC power connector (G) from the power supply.

6. Remove the power supply by removing the four (4) mounting screws (H) located at the corners of the power supply.

Note: If necessary, the power supply/main PCB mounting bracket can be removed by removing the two mounting screws from the rear of the instrument, and the two mounting screws located in the bottom flange of the mounting bracket at either end. Carefully tilt the bracket to access the power supply, taking care not to damage the main PCB located on the other side of the bracket.



7. Install the replacement power supply on the mounting bracket, making sure to maintain the same orientation, with the connections toward the rear of the instrument. Reinstall the power supply/main PCB mounting bracket, if necessary.

8. Connect the main harness DC power connector (the larger of the two connectors) to the new power supply, then connect the AC power harness.

9. Reinstall the printer assembly into the instrument by guiding it back into position from the front of the instrument. Replace the printer bracket mounting screws, making sure to position the printer bracket as noted during the disassembly, earlier. This location is important to ensure proper alignment to the instrument cover.

10. Remount the main PCB on the mounting standoffs, taking care not to bend or stress the main PCB. Reinstall two screws, if applicable.

11. Connect the printer power connection to the connector on the bottom of the printer interface board, then connect the printer data cable to the connection at the lower rear of the printer assembly.

12. Replace the instrument cover, taking care to align the cover so that there is space on either side of the printer cover, then secure with the screws.

13. Replace the head cover, then secure with the screws.

14. Reinstall the printer paper roll per the instructions in the User's Guide.

Printer Assembly Replacement
325400R
(Models 3250/4250 Serial Suffix A - C, only)

Reference: Use this instruction with part 325400R Printer Assembly.

NOTE: Printer assembly FL2401 is obsolete. All printers are upgraded by this kit to 325400.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver.

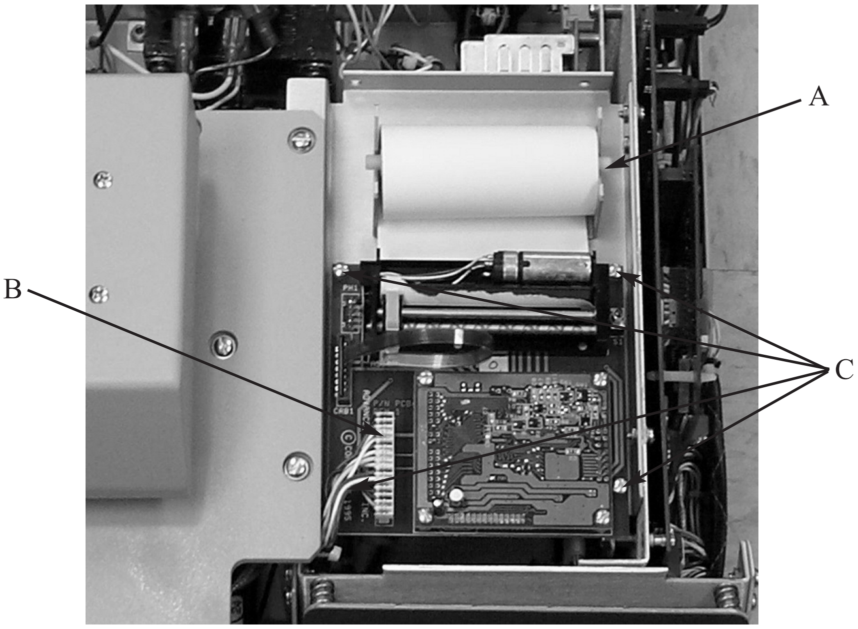
⚠ ***Warning-Hazardous Voltage***

Warning-Internal components may be damaged by static electricity.

⚠ **CAUTION:** Improper connections may cause damage to the instrument.

Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the screws securing the head cover, and remove the cover.
3. Remove the screws and slide the instrument cover up and off.
4. Remove the printer paper holder (A) and the printer paper by tearing the paper from the roll. Pull the remaining paper *forward* through the printer.
5. Disconnect the printer from the main harness (B).
6. Remove the four screws and nylon washers (C) from the printer base.



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7. Remove the old printer and reassemble the new one to the printer base using the screws and washers from step 6.

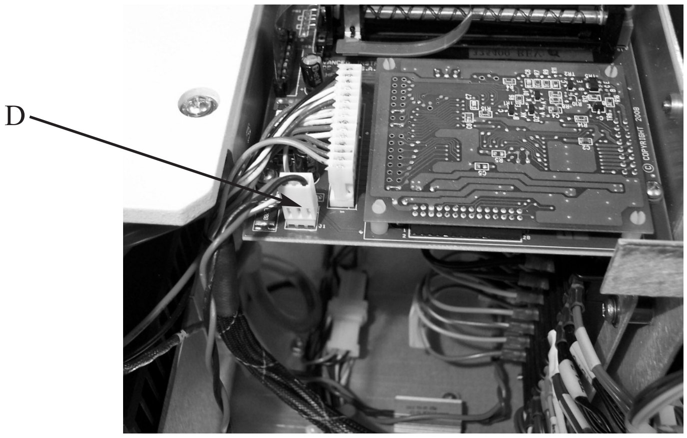
8. Locate cable 325410 (it contains two wires -- one black and one violet). If your instrument already has one of these, you may discard the one that came with this kit and skip steps 9-10.

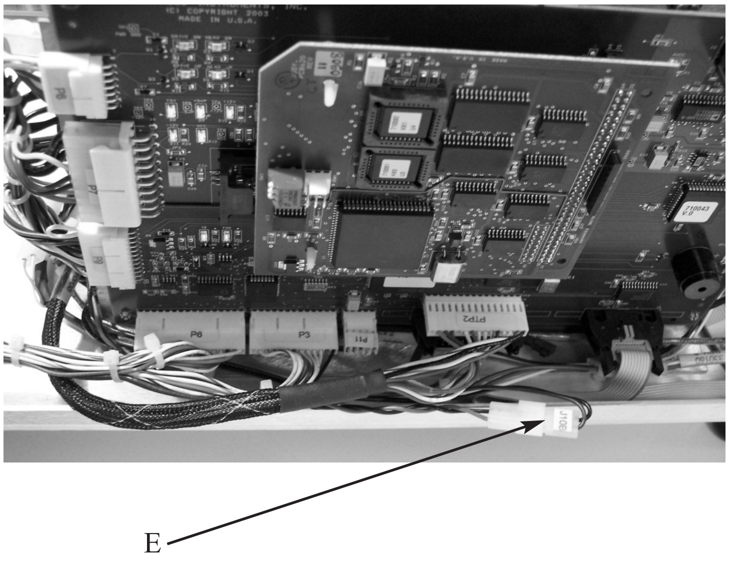
9. If you did not previously have this cable installed, then connect the end marked "**P1**" to the printer at connection "**J1**" (D).

10. Route the other end of the cable marked "**P10**" along the base, past the main circuit board, and connect it to "**J10B**" (E).

11. Reconnect the main harness.

12. Reassemble the instrument by replacing the printer paper holder and printer paper, and then the instrument and head covers.





Printer Assembly Replacement
325420R

Reference: Use this instruction to install part 325420R. This part should only be used with 3250/4250 instruments with serial suffix D or higher.

Tools Needed: Phillips screwdriver, static grounding (earthing) wrist strap (included), 3/16 L-shape Allen wrench, 7/64 L-shape Allen wrench.

Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

CAUTIONS:

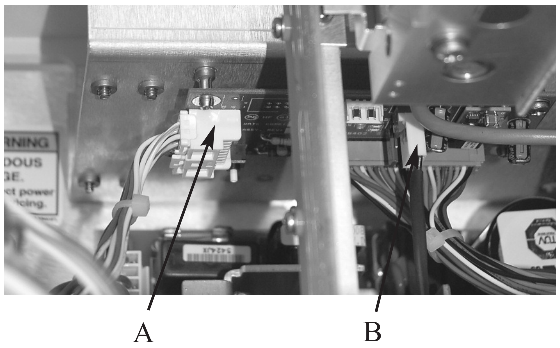
- **POWER CORD MUST BE DISCONNECTED TO PREVENT ELECTRIC SHOCK.**
- **NEVER UNPACK, TOUCH OR HANDLE ANY PCB WITHOUT WEARING A GROUNDING (EARTHING) STRAP TO MINIMIZE YOUR STATIC DISCHARGE.**

Instruction:

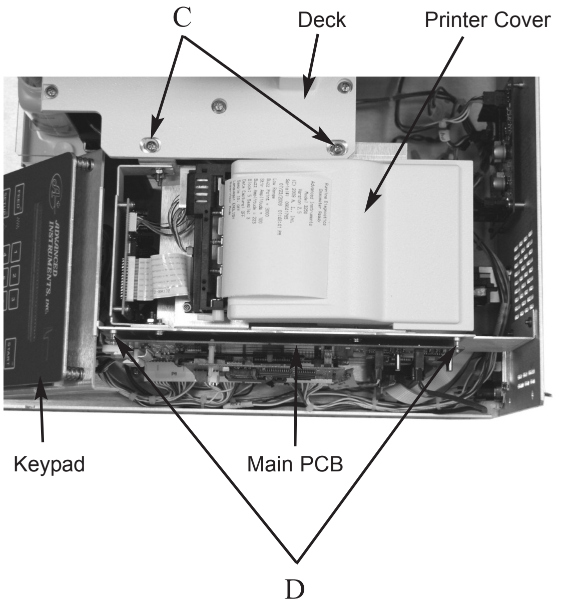
1. Turn off the power and unplug the instrument.

CAUTION: IT IS CRITICAL THAT THE INSTRUMENT BE UNPOWERED THROUGHOUT THIS REPLACEMENT PROCEDURE. ALWAYS UNPLUG THE INSTRUMENT FOR PERSONAL PROTECTION FROM HAZARDOUS VOLTAGES AND TO PREVENT POTENTIAL DAMAGE TO THE INSTRUMENT.

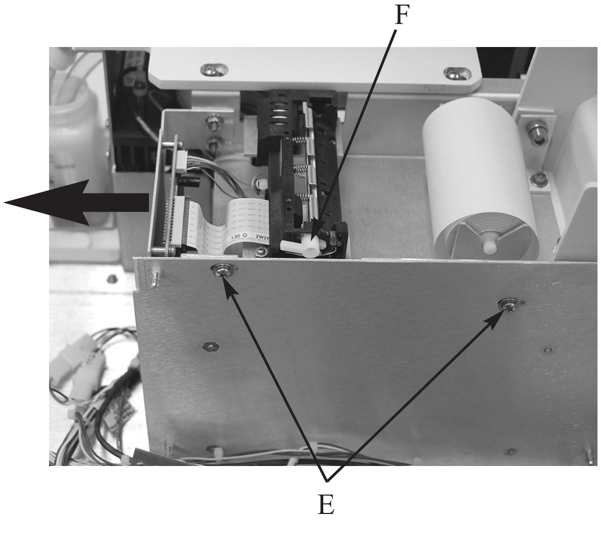
2. Remove the screws securing the head cover and remove the cover.
3. Release the printer cover, remove the screws securing the instrument cover, then slide the cover forward, then up and off to remove. Tilt the keypad forward to provide access and clearance to the printer assembly. Remove the installed paper roll from the printer assembly.
4. Locate the 325420 printer assembly mounted between the deck and the main PCB support. This includes the mounting bracket, the printer mechanism, printer control PCB, the printer interface PCB, and interconnecting cable.
5. Attach the static grounding strap to your wrist and stick the adhesive end to a suitable bare-metal ground, such as the rear panel.
6. Release cable end latch and disconnect the printer data cable (A) attached at the lower rear of the printer assembly, then disconnect the printer power connection (B) located in the middle side of the printer interface PCB, towards the sample cooling assembly and head.



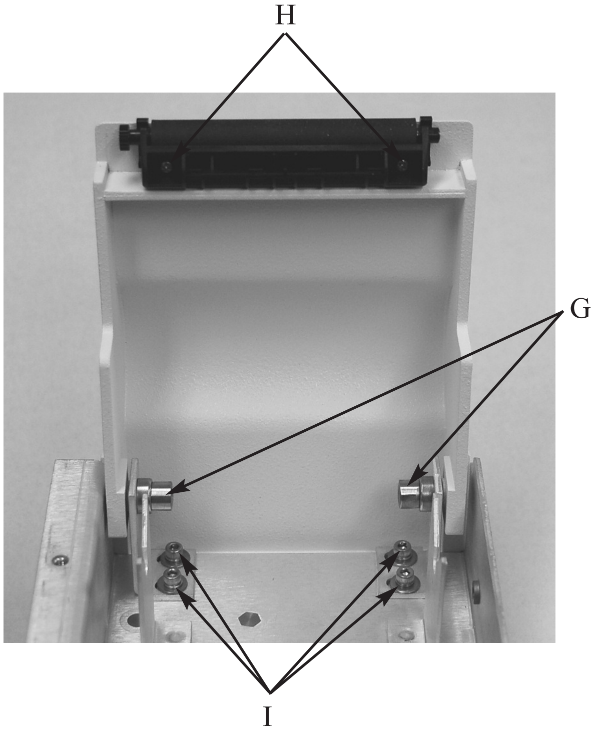
For additional information or technical assistance, please contact Advanced Instruments Hot-Line® Service Center (U.S. 1-800-225-4034, outside North America +US 1-781-320-9000).



7. Remove the two mounting screws (C) that attach the printer bracket to the deck.
8. Release the main PCB from the standoffs (D). Some instruments may require two screws be removed. Tilt the main PCB away from the mounting bracket. Note the front-to-back position of the mounting screws (E) that attach the printer bracket to the main PCB mounting bracket to assist during reassembly, then remove the two mounting screws.
9. To remove the printer assembly, slide the printer assembly towards the front of the instrument until the printer bracket is clear of the deck.



10. Transfer the following parts to the replacement printer assembly, as follows:
    a. Depress the printer door release lever (F) and open the printer door fully.
    b. Remove the printer door pivot screws (G), then remove the printer door.
    c. Remove the printer platen mounting screws (H), then remove the printer platen from the printer door.
    d. Release the printer platen from the replacement printer assembly by pressing the release lever on the printer. Install the replacement printer platen onto the printer door.
    e. Remove the printer door support bracket mounting screws (I), then install the printer door support bracket in the replacement printer assembly. Tighten the screws only enough to



hold the brackets in place, but still allow them to be moved on the printer mounting bracket.

f. Position the printer door, then install the printer door pivot screws.

g. Close the printer door, making sure the platen is fully engaged in the printer mechanism. Allow the printer mechanism to guide the position of the door, moving the printer door support brackets as needed. Once adjusted, tighten the printer door support bracket mounting screws.

h. Test the open/close action of the printer door by pressing the printer door release lever, then swinging the printer door back, then re-engaging the printer door into the printer mechanism. The printer door should move freely in and out of the printer mechanism with a distinct latching or release action, but without binding. If necessary, loosen and adjust the printer door support brackets until the action is acceptable.

11. Install the replacement printer assembly into the instrument by guiding it back into position from the front of the instrument. Replace the printer bracket mounting screws, making sure to position the printer bracket as noted during the disassembly, earlier. This location is important to ensure proper alignment to the instrument cover.

12. Make sure printer flex cable (J) is positoned as shown.

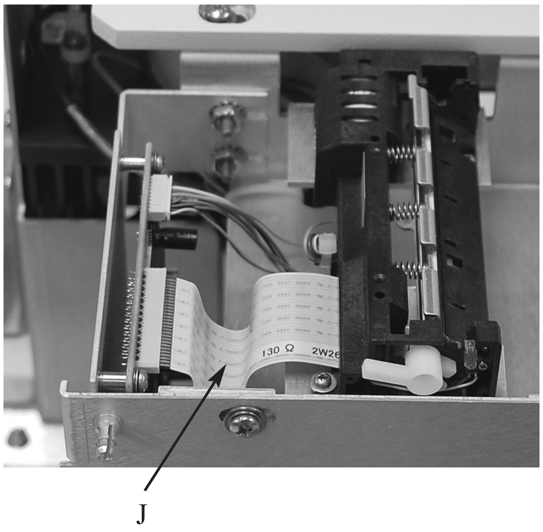
13. Remount the main PCB on the mounting standoffs, taking care not to bend or stress the main PCB. Reinstall two screws, if applicable.

14. Connect the printer power connection to the connector on the bottom of the printer interface board, then connect the printer data cable to the connection at the lower rear of the printer assembly.

15. Replace the instrument cover, taking care to align the cover so that there is space on either side of the printer cover, then secure with the screws.

16. Replace the head cover, then secure with the screws.

17. Reinstall the printer paper roll per the instructions in the User’s Guide.



Printer Mechanism Replacement
325404R

Reference: Use this instruction to install part 325404R. This part should only be used with 3250/4250 instruments with serial suffix D or higher.

Tools Needed: Small Phillips screwdriver (#0), custom wrench (included).

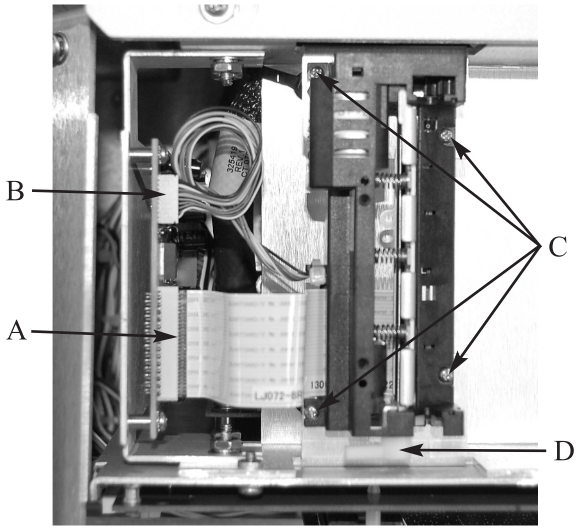
Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

CAUTION: Power cord must be disconnected to prevent electrick shock.

Instruction:

1. Turn off the power and unplug the instrument.
2. Release the printer cover and remove the screws securing the instrument cover. Slide the cover forward, then up, tilting the cover to clear the head cover, and off to remove. Open the printer cover fully and remove the installed paper roll from the printer assembly.
3. Disconnect the printer flex cable (A), then disconnect the printer power connection (B) located at the rear top of the printer controller PCB.
4. Remove the four mounting screws, nuts, washers, and lock washers (C) that attach the printer mechanism to the printer mounting bracket. Use a finger to trap and retain the nuts and washers and prevent them from falling into the instrument below the printer. These can be used to mount the replacement printer mechanism, although additional hardware is supplied.
5. Remove the printer platen mounting screws, then remove the printer platen from the printer door.
6. Release the printer platen from the replacement printer assembly by pressing the printer door release lever (D) on the printer. Install the replacement printer platen onto the printer door.
7. Install the replacement printer mechanism onto the printer mounting bracket using four (4) 2-56 x 3/8 screws, with a flat washer, lock washer and nut for each. A custom wrench has been supplied to help hold and position these nuts and washers until the screw threads have engaged. Do not tighten the screws at this time.
8. Close the printer door, making sure the platen is fully engaged in the printer



Printer Mechanism without Platen

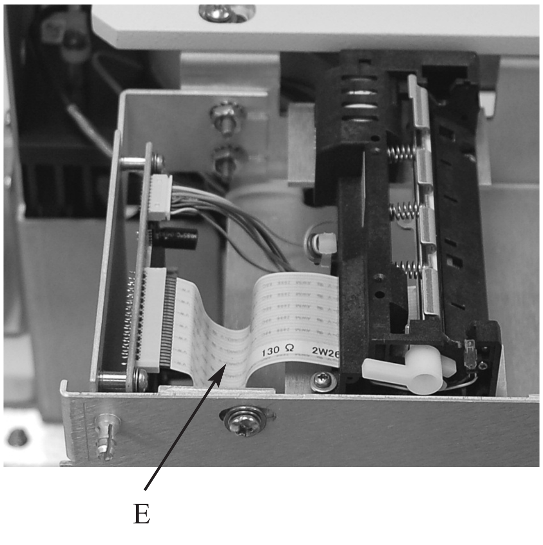
ADVANCED INSTRUMENTS, INC.
Two Technology Way / 781-320-9000
Norwood, Massachusetts 02062, USA
800-225-4034 Fax: 781-320-8181
www.aicompanies.com

For additional information or technical assistance, please contact Advanced Instruments Hot-Line® Service Center (U.S. 1-800-225-4034, outside North America +US 1-781-320-9000).

mechanism. Allow the printer door and platen to position the printer mechanism. Keep the printer door closed and tighten the front mounting screws. Once tightened, press the printer door release lever and open the printer door fully. Tighten the rear mounting screws.

9. Test the open/close action of the printer door by closing the printer door, pressing the printer door release lever, then swinging the printer door back, then re-engaging the printer door into the printer mechanism. The printer door should move freely in and out of the printer mechanism with a distinct latching or release action, but without binding. If necessary, loosen and adjust the printer mechanism mounting screws until the action is acceptable.

10. Connect the printer flex cable and the printer power connection from the replacement printer mechanism to their respective connectors located at the top rear of the printer controller PCB. Make sure the flex cable (E) is posititoned as shown, with the excess cable looped down.



11. Replace the instrument cover, taking care to align the cover so that there is space on either side of the printer cover, then secure with the screws.

12. Reinstall the printer paper roll per the instructions in the User's Guide.

Probe Alignment Instructions for Alignment Tool 3LA702 or Alignment Toolkit 3LA700

Reference: Use this instruction with part 3LA702 or kit 3LA700 and any of the following models of Advanced Instruments, Inc. or Fiske Associates® osmometers or cryoscopes:

Advanced Instruments Inc.
4250, 4D3 & 4C3 Cryoscopes
3250, 3D3 & 3900 Osmometers

Fiske Associates
Mark 2 Cryoscopes
Mark 3 Osmometers

Tools Needed: Phillips or flat-bladed screwdriver; small flat-bladed screwdriver; 5/64", 9/64" and 1/16" Allen wrenches.

Proper alignment and adjustment of the mandrel, probe and stir/freeze wire are of utmost importance to assure accuracy, precision and proper operation of the instrument. Use the probe alignment tool to precisely center the probe and position the stir wire according to factory specifications.

Figure 1 shows all of the components of the sample head. Although an osmometer head is shown, a cryoscope head is almost identical, with the only differences being the material of the sample probe and the diameter and shape of the stir wire.

The alignment and adjustment of the mandrel, sample probe, and stir/freeze wire on the Model 3900 multi-sample osmometer and

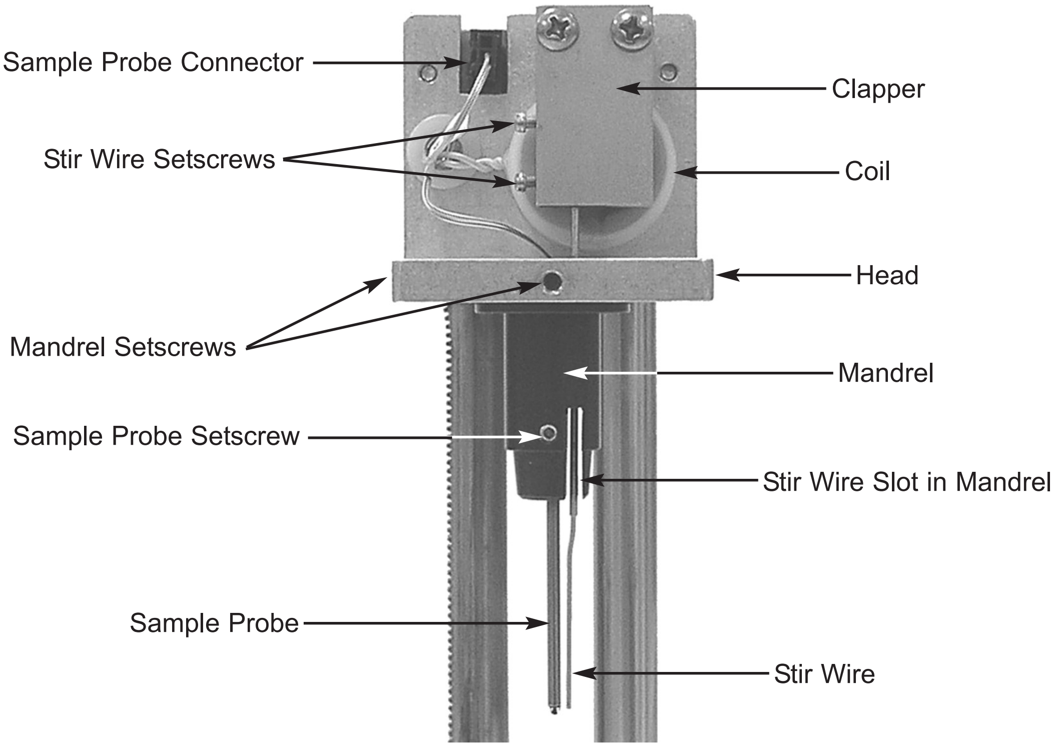


Figure 1. Osmometer Sample Head

Model 4C3 multi-sample cryoscope is essentially the same as what is described here for the single-sample osmometer or cryoscope.

CAUTION: Turn off the osmometer or cryoscope while making the following checks or adjustments.

General Instructions:

1. Remove the head cover.
2. Before checking the probe or stir wire alignment, make sure the mandrel is positioned and aligned, as follows (refer to Figures 1 and 2):
    a. Make sure there is no gap between the top of the mandrel flange and the bottom of the sample head.
    b. Look to see if the stir wire slot in the mandrel is aligned so that it is perpendicular with the front edge of the sample head (Figure 2).
    c. If adjustments are necessary, while supporting the mandrel loosen the two mandrel setscrews in the head, make the adjustments, then carefully retighten the mandrel setscrews.

Osmometer Instructions:

1. Facing the instrument from the front, slide the alignment tool squarely up onto the mandrel, round-end first, with the stir/freeze wire located as shown in Figure 3.
2. Check the probe alignment by making sure that the probe shaft is lined up along the raised V centerline of the alignment tool and the probe level by making sure that the end of the probe rests on the horizontal surface below the raised V centerline, as shown in Figure 3.
3. If necessary, make probe centering adjustments. Bend the metal probe stem gently by hand, as necessary, to align the probe along the raised V centerline of the probe alignment tool.
4. If necessary, make probe vertical adjustments:
    a. Loosen the probe setscrew (Figure 1) and then raise or lower the probe within its mandrel, as necessary.
    b. When the bottom of the probe is exactly level with the horizontal step,

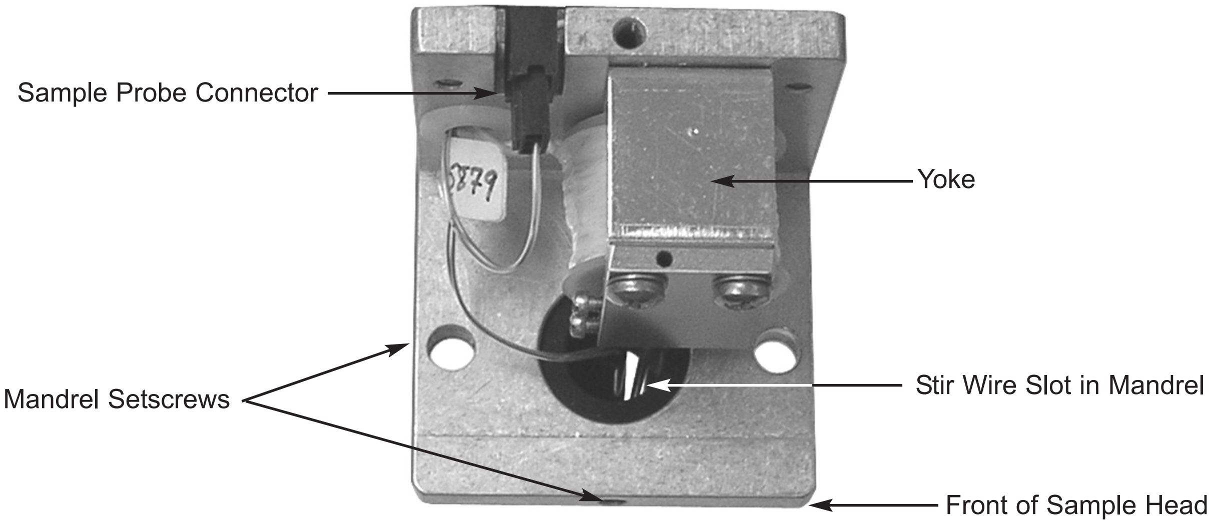


Figure 2. Elevated View of Osmometer Head

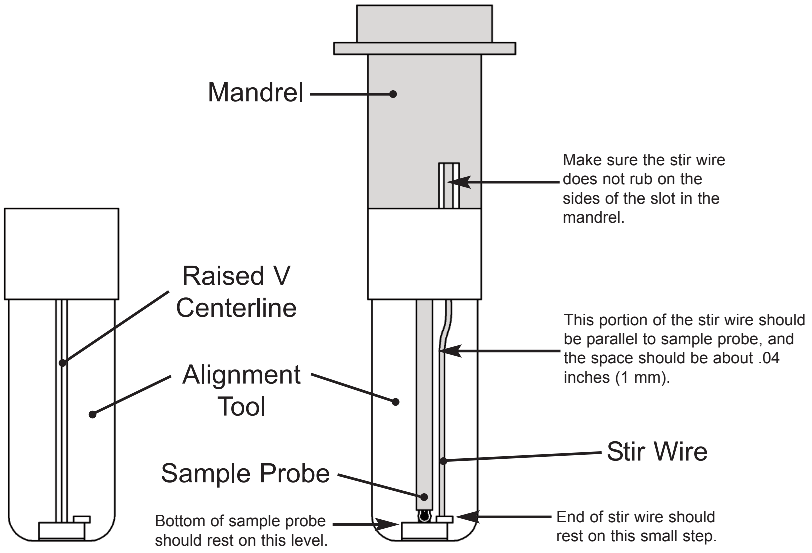

Mandrel
Make sure the stir wire does not rub on the sides of the slot in the mandrel.
Raised V Centerline
This portion of the stir wire should be parallel to sample probe, and the space should be about .04 inches (1 mm).
Alignment Tool
Stir Wire
Sample Probe
Bottom of sample probe should rest on this level.
End of stir wire should rest on this small step.

Figure 3. Osmometer Alignment

gently retighten the probe setscrew (overtightening will crack or distort the thin plastic wall of the mandrel).

5. After completing any adjustments, recheck the probe alignment and level.

6. Check the stir wire alignment and level (see Figure 3 notes). In the front-to-back direction, the stir wire should be even with the sample probe.

7. If necessary, make stir wire adjustments, as follows:

   a. To realign the stir wire in the slot in the mandrel, note the position of the top of the yoke relative to the top of the head, then partially loosen the coil core/yoke screw (see Figure 4) from the back of the head. Move the yoke/clapper/stir wire assembly side-to-side until the stir wire is in the correct position relative to the slot. Make sure to maintain the previously noted

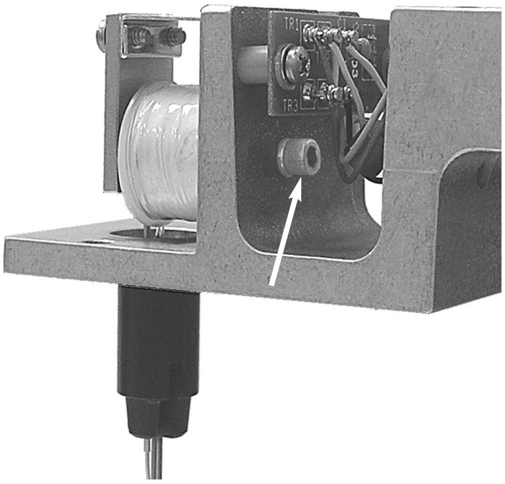


Figure 4. Coil Core Mounting Screw

yoke vertical position relative to the head. Retighten the screw, making sure that the yoke/clapper/stir wire assembly does not rotate in place.

   b. To adjust the vertical position of the stir wire, loosen the two stir wire setscrews (Figure 1) in the clapper, then reposition the stir wire so that it is resting on top of the small step, as shown in Figure 3.

   c. Firmly retighten the stir wire setscrews.

Cryoscope Instructions:

1. Facing the instrument from the front, slide the alignment tool squarely up onto the mandrel, round-end first, with the stir/freeze wire located as shown in Figure 5.

2. Check the probe alignment by making sure that the probe shaft is lined up along the raised V centerline of the alignment tool and the probe level by making sure that the end of the probe rests on the horizontal surface below the raised V centerline, as shown in Figure 5. Note that the orientation of the alignment tool is 90º from the way the tool is used with an osmometer.

3. If necessary, make probe centering adjustments:

   a. If aligning a metal probe, bend the metal probe stem gently by hand, as necessary, to align the probe along the raised V centerline of the probe alignment tool.

   b. If aligning a non-metallic probe, DO NOT ATTEMPT TO BEND THE PROBE; instead, loosen the probe setscrew (see Figure 1) and then rotate the probe so that any curvature in the probe is in the back-to-front direction (parallel to the stir wire action).

   c. Gently retighten the probe setscrew (overtightening will crack or distort the thin plastic wall of the mandrel).

4. If necessary, make probe vertical adjustments:

   a. Loosen the probe setscrew (Figure 1) and then raise or lower the probe within its mandrel, as necessary.

   b. When the bottom of the probe is exactly level with the horizontal step, gently retighten the probe setscrew (overtightening will crack or distort the thin plastic wall of the mandrel).

5. After completing any adjustments, recheck the probe alignment and level.

6. Check the stir wire alignment and level (see Figure 5 notes). In the front-to-back direction, the stir wire should be even with the sample probe.

7. If necessary, make stir wire adjustments:

   a. To realign the stir wire in the slot in the mandrel, note the position of the top of the yoke relative to the top of the head, then partially loosen the coil core/yoke screw (see Figure 4) from the back of the head. Move the yoke/clapper/stir wire assembly side-to-side until the stir wire is in the correct position relative to the slot. Make sure to maintain the previously noted yoke vertical position relative to the head. Retighten the screw, making sure that the yoke/clapper/stir wire assembly does not rotate in place.

   b. To adjust the vertical position of the stir wire, loosen the two stir wire

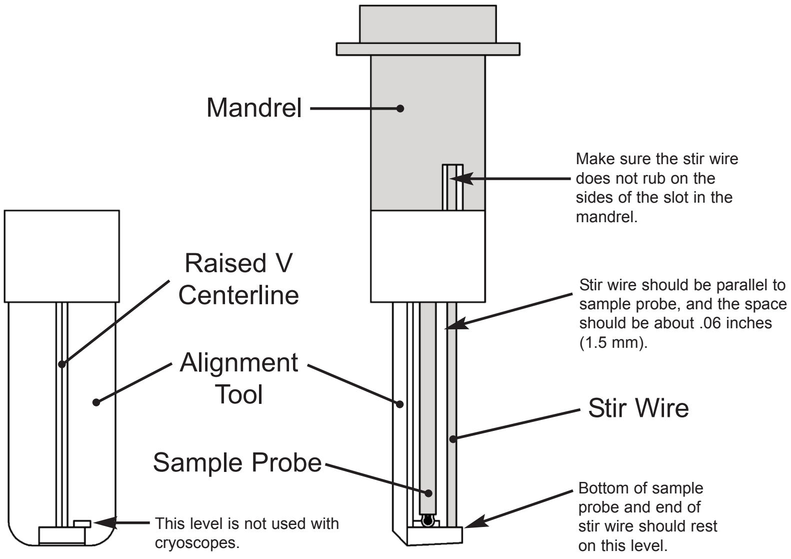

Mandrel
Make sure the stir wire does not rub on the sides of the slot in the mandrel.
Raised V Centerline
Stir wire should be parallel to sample probe, and the space should be about .06 inches (1.5 mm).
Alignment Tool
Stir Wire
Sample Probe
Bottom of sample probe and end of stir wire should rest on this level.
This level is not used with cryoscopes.

Figure 5. Cryoscope Alignment

setscrews (Figure 1) in the clapper, then reposition the stir wire so that it is resting on the same level as the end of the sample probe (Figure 5).

c. Firmly retighten the stir/freeze wire setscrew(s).

Sample Probe Replacement
3D3700

Reference: Use this instruction with replacement part 3D3700 (stainless steel) or 4D3102 (non-metallic), and any of the following models of Advanced Instruments, Inc. or Fiske Associates® osmometer or cryoscope:

Advanced Instruments Inc.

4250 Cryoscopes (Serial Suffix E - W)
4D3 Cryoscopes (Serial Suffix E - W)
3250 Osmometers (Serial Suffix C - T)
3D3 Osmometers (Serial Suffix C - T)

Fiske Associates

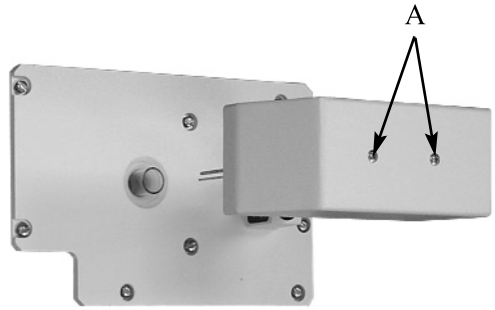
Mark 2 Cryoscopes
Mark 3 Osmometers

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, probe alignment tool and instructions (included).

CAUTION: Improper connections may cause damage to the instrument.

Instruction:

1. Place an empty sample tube in the freezing chamber to catch any extraneous material that might fall in.

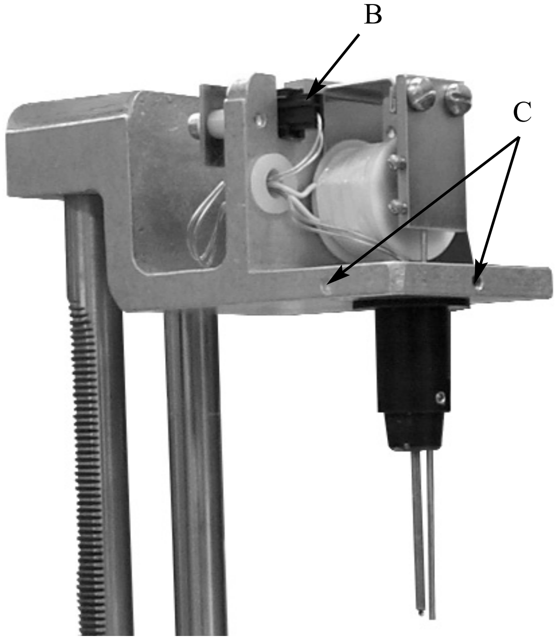


2. Turn off the power and unplug the instrument.

3. Remove the two screws from the head cover (A) and lift off the head cover.

4. Unplug the sample probe connector from the head transition board (B).

5. Loosen the two mandrel setscrews (C).



6. Lower the probe and mandrel together, down over the stir/freeze wire.

7. Push the connector and lead wires of the new sample probe up through the hole in the sample head, and raise the mandrel so that the stir/freeze wire extends down through the stir/freeze wire channel in the mandrel.

For additional information or technical assistance, please contact Advanced Instruments Hot-Line® Service Center (U.S. 1-800-225-4034, outside North America +US 1-781-320-9000).

8. Seat the mandrel firmly up into the mandrel hole, with the stir/freeze wire channel perpendicular to the front edge of the chassis and no gaps between the flange and the underside of the chassis.

9. Without overtightening (*overtightening can damage the mandrel*), re-tighten the two mandrel setscrews to hold the mandrel in place.

Note: *The probe length is factory-adjusted to the mandrel, and should not require further adjustment.*

10. Use the probe alignment tool and instructions to properly position the probe and stir/freeze wire.

11. Plug the sample probe connector into the head transition board.

12. Arrange the probe leads so that they will not touch the clapper or be pinched by the head cover, and replace the cover.

13. Plug in the power cord and turn on the instrument.

14. Set the sample bin number (see the following procedure).

15. Calibrate the instrument. (Recalibration is required each time the sample probe is replaced.)

Set Sample Bin Number

1. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. Press **TEST**. Press < or > to select "**Probe Bin Test**", and then press **START**.

3. Place a sample of Probe Bin-Setting Fluid into the freezing chamber.

4. At "**[START] Ready?**", press **START**.

5. At the end of the test, record the sample probe resistance and the bin number, and then press **STOP**. The display will change to "**Probe Bin Test**".

   To set the correct sample bin number, follow steps 6-8.

   If the current sample bin number matches the number just recorded, press **STOP** *twice* to exit the menu.

6. Press **SETUP**. The Supervisor/Operator keyswitch must be in the Supervisor position.

7. At "**Select Setup Item**", press < or > to select "**Select Sample Bin #**", and then press **START**.

8. If the current sample bin number is not the same as the one recorded in step 5, enter the correct number, press **ENTER**, and then press **STOP** *twice* to exit the menu.

Obsolete

Sample Probe Replacement
3D3700

Reference: Use this instruction with replacement part 3D3700.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, probe alignment tool and instructions (included).

CAUTION: ⚠ Improper connections may cause damage to the instrument.

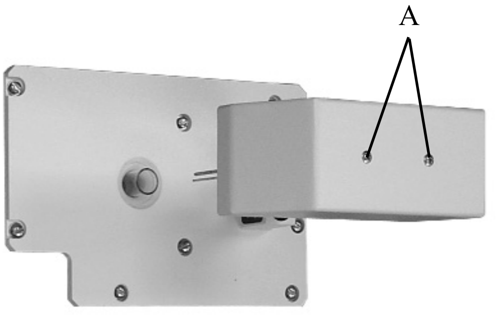
Instruction:

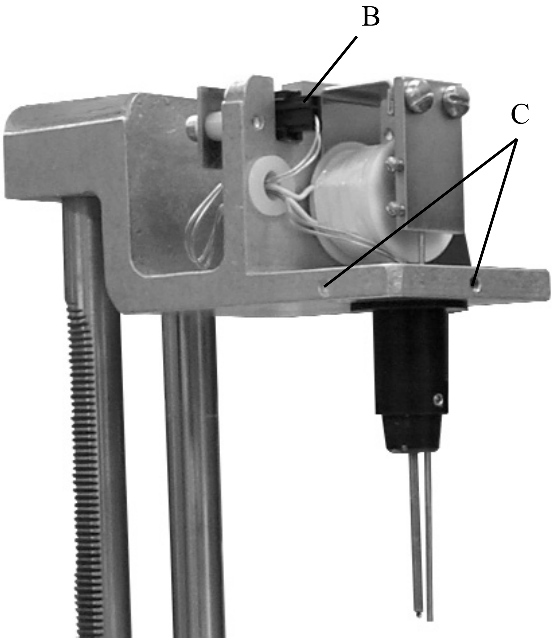
1. Place an empty sample tube in the freezing chamber to catch any extraneous material that might fall in.

2. Turn off the power and unplug the instrument.

3. Remove the two screws from the head cover (A) and lift off the head cover.

4. Unplug the sample probe connector from the head transition board (B).





5. Loosen the two mandrel setscrews (C).

6. Lower the probe and mandrel together, down over the stir/freeze wire.

7. Push the connector and lead wires of the new sample probe up through the center hole of the mandrel, and raise the mandrel so that the stir/freeze wire extends down through the stir/freeze wire channel in the mandrel.

8. Seat the mandrel firmly up into the mandrel hole, with the stir/freeze wire channel perpendicular to the front edge of the chassis and no gaps between the flange and the underside of the chassis.

Obsolete

9. Without overtightening (*overtightening can damage the mandrel*), re-tighten the two mandrel setscrews to hold the mandrel in place.

Note: *The probe length is factory-adjusted to the mandrel, and should not require further adjustment.*

10. Use the probe alignment tool and instructions to properly position the probe and stir/freeze wire.
11. Plug the sample probe connector into the head transition board.
12. Arrange the probe leads so that they will not touch the clapper or be pinched by the head cover, and replace the cover.
13. Plug in the power cord and turn on the instrument.
14. Set the sample bin number (see the following procedure).
15. Calibrate the instrument. (Recalibration is required each time the sample probe is replaced.)

Set Sample Bin Number

1. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).
2. Press **TEST**. Press **<** or **>** to select "**Probe Bin Test**", and then press **START**.
3. Place a sample of Probe Bin-Setting Fluid into the freezing chamber.
4. At "**[START] Ready?**", press **START**.
5. At the end of the test, record the sample probe resistance and the bin number, and then press **STOP**. The display will change to "**Probe Bin Test**".

   To set the correct sample bin number, follow steps 6-8.

   If the current sample bin number matches the number just recorded, press **STOP** *twice* to exit the menu.

6. Press **SETUP**. The Supervisor/Operator keyswitch must be in the Supervisor position.
7. At "**Select Setup Item**", press **<** or **>** to select "**Select Sample Bin #**", and then press **START**.
8. If the current sample bin number is not the same as the one recorded in step 5, enter the correct number, press **ENTER** *twice*, and then press **STOP** to exit the menu.

Obsolete

Sample Probe Replacement
4D3102

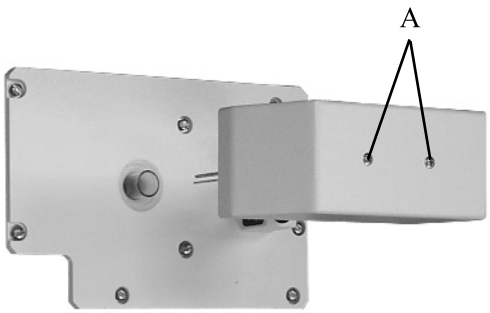
Reference: Use this instruction with replacement part 4D3106.

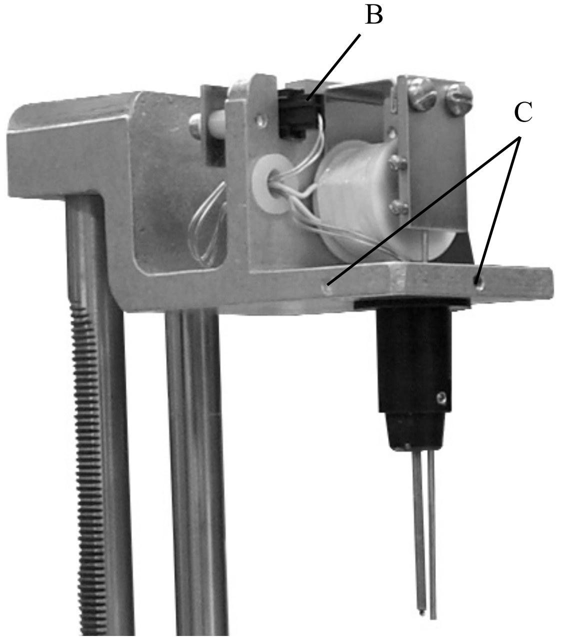
Tools Needed: Phillips screwdriver, flat-bladed screwdriver, probe alignment tool and instructions (included).

⚠ **CAUTION:** Improper connections may cause damage to the instrument.

Instruction:

1. Place an empty sample tube in the freezing chamber to catch any extraneous material that might fall in.
2. Turn off the power and unplug the instrument.
3. Remove the two screws from the head cover (A) and lift off the head cover.
4. Unplug the sample probe connector from the head transition board (B).
5. Loosen the two mandrel setscrews (C).





6. Lower the probe and mandrel together, down over the stir/freeze wire.
7. Push the connector and lead wires of the new sample probe up through the center hole of the mandrel, and raise the mandrel so that the stir/freeze wire extends down through the stir/freeze wire channel in the mandrel.
8. Seat the mandrel firmly up into the mandrel hole, with the stir/freeze wire channel perpendicular to the front edge of the chassis and no gaps between the flange and the underside of the chassis.
9. Without overtightening (*overtightening can damage the mandrel*), re-tighten the two mandrel setscrews to hold the mandrel in place.

Obsolete

Note: *The probe length is factory-adjusted to the mandrel, and should not require further adjustment.*

10. Use the probe alignment tool and instructions to properly position the probe and stir/freeze wire.

11. Plug the sample probe connector into the head transition board.

12. Arrange the probe leads so that they will not touch the clapper or be pinched by the head cover, and replace the cover.

13. Plug in the power cord and turn on the instrument.

14. Set the sample bin number (see the following procedure).

15. Calibrate the instrument. (Recalibration is required each time the sample probe is replaced.)

Set Sample Bin Number

1. If there is a Supervisor/Operator keyswitch, turn it to the Supervisor position (if required).

2. Press **TEST**. Press **<** or **>** to select "**Probe Bin Test**", and then press **START**.

3. Place a sample of Probe Bin-Setting Fluid into the freezing chamber.

4. At "**[START] Ready?**", press **START**.

5. At the end of the test, record the sample probe resistance and the bin number, and then press **STOP**. The display will change to "**Probe Bin Test**".

   To set the correct sample bin number, follow steps 6-8.

   If the current sample bin number matches the number just recorded, press **STOP** *twice* to exit the menu.

6. Press **SETUP**. The Supervisor/Operator keyswitch must be in the Supervisor position.

7. At "**Select Setup Item**", press **<** or **>** to select "**Select Sample Bin #**", and then press **START**.

8. If the current sample bin number is not the same as the one recorded in step 5, enter the correct number, press **ENTER**, and then press **STOP** *twice* to exit the menu.

Cryoscope Sample Probe Versions
Frequently Asked Questions (FAQ)

A new, composite, stainless steel and plastic body cryoscope sample probe has been released for use in the Advanced Instruments, Inc. single and multi-sample cryoscopes (Models 4D3, 4C3 and 4250).

A) What is the difference between the three versions of sample probe?

Answer: Only the body material is different. Type A used a brazed stainless steel body; Type B used a one-piece plastic body; and Type C uses a composite stainless steel and plastic body. All three use the same high accuracy glass thermistor as the sensing element.

B) Is this new probe used in the osmometers?

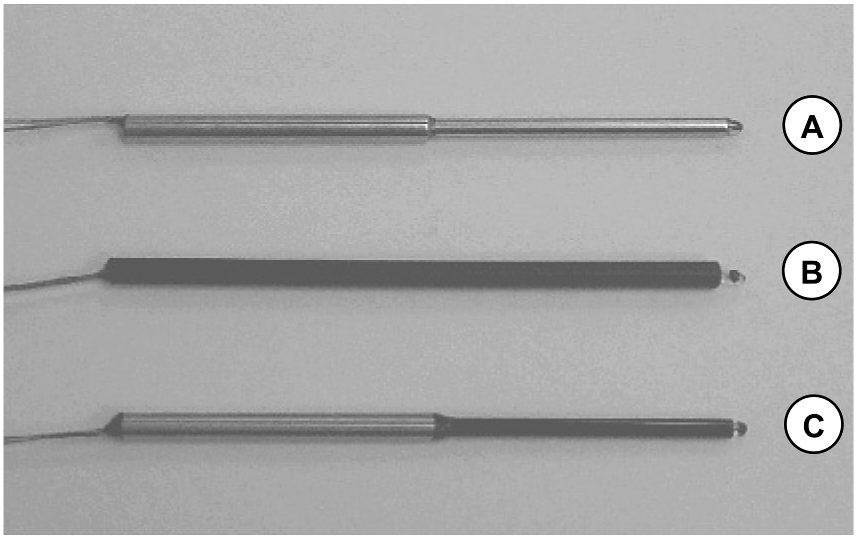
Answer: No, this change is only for cryoscopes and does not affect the all-stainless steel body sample probe used in the osmometers.

C) Why has the design been changed?

Answer: The stainless steel probe, Type A, exceeded the thermal conductance limits specified in ISO 5764, therefore, the plastic probe, Type B, was developed to meet these new requirements. Type B, although compliant with the new ISO 5764 standard, proved to be difficult to manufacture, which has led to the composite design probe, Type C. This design uses the strength of stainless steel up in the mandrel, yet has the lower thermal conductance of plastic where the probe is immersed in the sample.

D) My cryoscope has been operating without any problems. Do I need to change the probe? Will I see any performance change?

Answer: If your cryoscope needs to be compliant to the ISO 5764 standard and you are currently using a Type A probe,



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then you must change to the new Type C probe. If you are currently using a Type B probe, then there is no reason to change the probe at this time. There should be no performance difference between the Type B and Type C sample probe designs.

E) Is there any difference in the handling and maintenance of the three types of probe?

Answer: During the initial installation of the sample probe, the Type A stainless steel probe may be bent slightly during the alignment procedure. Although the Type B and Type C probes are more flexible than the Type A probe, they cannot be permanently bent due to the plastic construction. If a change is needed during alignment, the probe should be rotated in the mandrel to the desired position.

During cryoscope operation, the same wiping and cleaning process may be used for any of these probes. To minimize potential damage, care should always be taken to avoid hitting the glass thermistor bead.

F) When were these probes used in cryoscope production?

Answer: Cryoscopes shipped prior to April 2002 contain the stainless steel Type A probe.

Cryoscopes shipped from April 2002 through May 2003 contain the plastic Type B probe.

Cryoscopes shipped in June 2003 and later contain the new, composite stainless steel/plastic Type C probe.

G) Does this change the part numbers used to order replacement sample probes for my cryoscope?

Answer: If you are currently using the one-piece plastic, Type B sample probe, then there is no change to the part numbers (listed below). The new, Type C probes are completely interchangeable with the Type B probes.

Cryoscope	Sample Probe Replacement Kit
Model 4D3	4D3102
Model 4C3	4C3701
Model 4250	4D3102

Stir/Freeze Coil Replacement
3D2404R

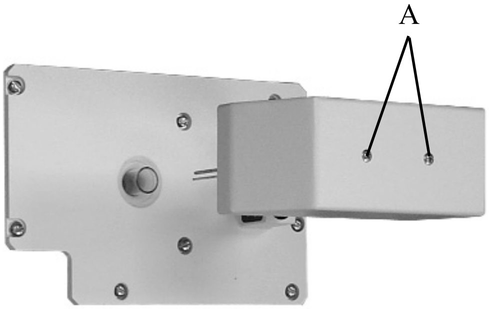
Reference: Use this instruction with replacement part 3D2404R.

Tools Needed: Phillips screwdriver; flat-bladed screwdriver; Allen wrench; soldering iron and rosin-core solder; probe alignment tool and instructions (included).

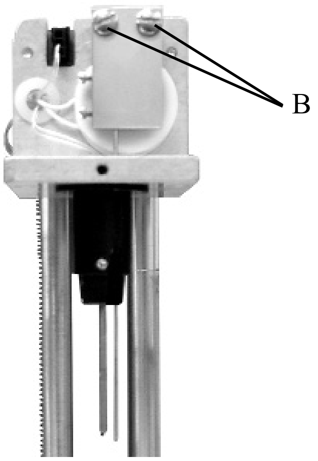
CAUTION: ⚠ Improper connections may cause damage to the instrument.

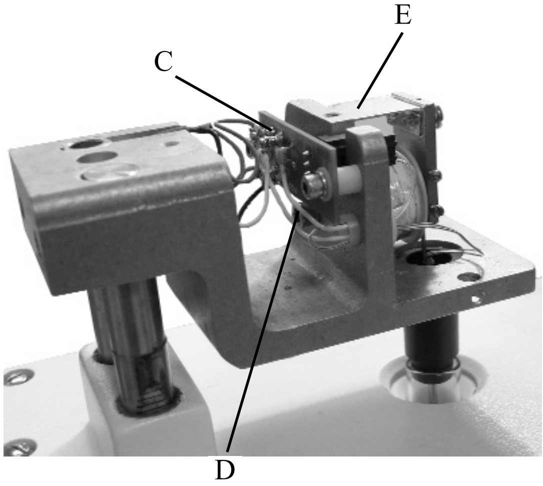
Instruction:

1. Place an empty sample tube in the freezing chamber.



2. Turn off the power and unplug the instrument.
3. Remove the two screws from the head cover (A) and lift off the head cover.
4. Remove the two screws (B) that attach the clapper to the yoke and lift the clapper to remove it.





5. Identify the coil leads where they connect to the terminal strip at TR1 and TR2 (C), and snip off the leads as close to the terminal strip as possible.
6. Remove the Allen screw (D) that attaches the yoke (E) and coil to the assembly.
7. Remove the old coil and replace it with the new one, and then replace the Allen screw.

8. Feed the replacement coil leads through the access hole and solder the lead ends to TR1 and TR2 on the terminal strip.

9. Reassemble by reversing steps 2-4.

Note: *Make sure the yoke level doesn't interfere with the head cover.*

10. Use the probe alignment tool and instructions to properly position the stir/freeze wire.

Stir/Freeze Wire Replacement
3LH243/4LH243

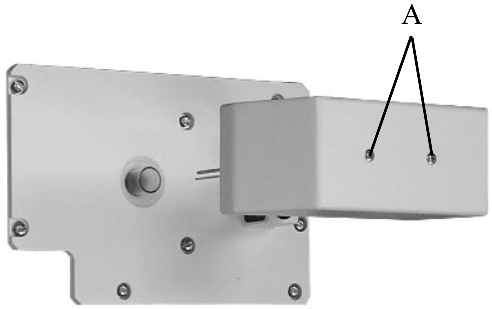
Reference: Use this instruction with replacement part 3LH243 or 4LH243.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, 5/64” Allen wrench, probe alignment tool and instructions.

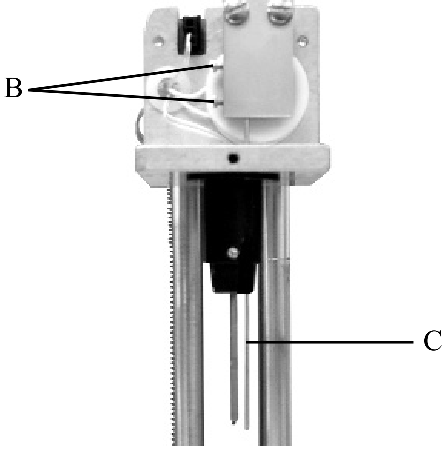
CAUTION: ⚠ Improper connections may cause damage to the instrument.

Instruction:

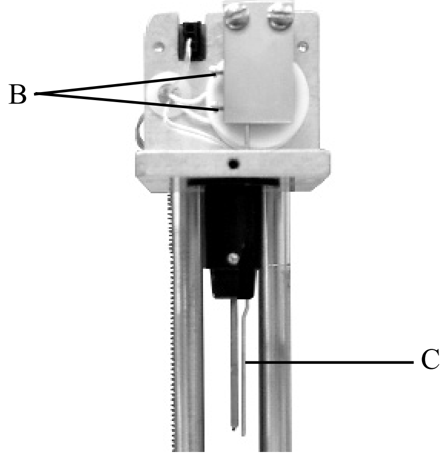
1. Turn off the power and unplug the instrument.
2. Remove the two screws from the head cover (A) and lift off the head cover.



3. Loosen the two stir/freeze wire setscrews (B) from the clapper.
4. Gently pull the stir/freeze wire (C) down and out through the mandrel.
5. Replace the old stir/freeze wire with the new one and reassemble by reversing steps 2-4.
6. Use the probe alignment tool and instructions to properly position the stir/freeze wire.



4250 / 4D3 Cryoscope



3250 / 3D3 Osmometer

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PCB520 Transistor Replacement Instruction
35010 to PCB520R Substitution
(Models 4D3, 3D3, 3250*, 4C3, 3900, and 4250*)

***Not for use on Models 3250/4250 with serial suffix D and higher.**

Reference: Use this instruction to install part PCB520R, which is intended as a direct replacement for part 35010 metal can FET transistor used on some of the above models.

Materials Included:

- 1 - PCB520 assembly
- 2 - H50606, #6x3/8 Sems
- 2 - H50608, #6x1/2 Sems
- 2 - H63093, #6 large flat washers
- 2 - 90049, Hex swage standoffs
- 2 - 91038, ¼” plastic hole plugs

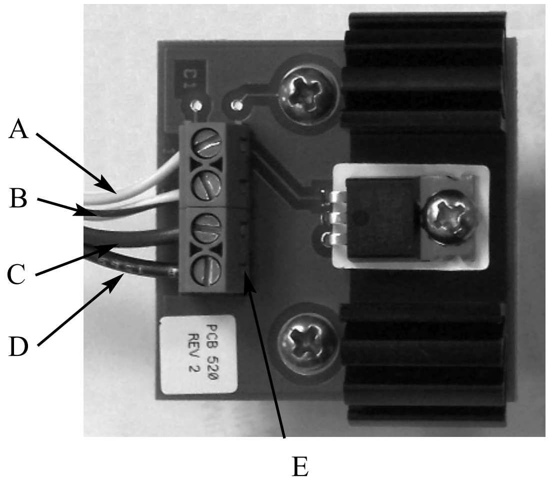
Tools Needed: Wire cutters, wire strippers, small flat-bladed screwdriver, medium Phillips screwdriver.

⚠ ***Warning-Hazardous Voltage***

Warning-Internal components may be damaged by static electricity.

4D3, 3D3, 3250, and 4250 Instruction:

1. Turn off the instrument power and disconnect the power cord.
2. Remove the intrument cover.
3. Locate transistor Q1B on left-rear of the chassis. Q1B is the transistor nearest to the top of the rear panel.
4. If your instrument already has PCB520 in this location, remove the old PCB and skip to step 11.
5. Remove the screws securing the protective black plastic cap on the outside rear of the instrument.
6. Remove the old transistor and insulating materials by gently prying with a flat-bladed screwdriver.
7. Remove the transistor socket Q1B from the rear panel and clear the mounting holes of any remaining hardware.
8. Cut transistor socket Q1B from harness M20150.
9. Strip wire insulation ¼” on four (4) wires formerly soldered to the transistor socket. Twist the stripped ends to prevent fraying.
10. Install the hex standoffs to PCB520 using #6x3/8 screws, with the flat end of the standoff against the board.
11. Connect white/red wire to terminal 1 (A).
12. Connect white/brown wire to terminal 2 (B).
13. Connect brown wire to terminal 3 (C).
14. Connect black wire to terminal 4 (D).



For additional information or technical assistance, please contact Advanced Instruments Hot-Line® Service Center (U.S. 1-800-225-4034, outside North America +US 1-781-320-9000).

Note: *Make sure screw terminals are tight and that only bare wire, not insulation, is captured in the clamp.*

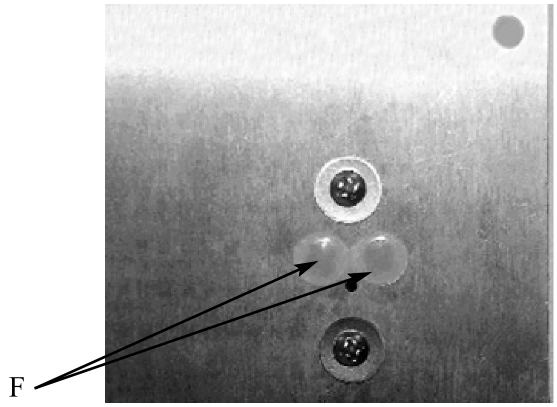
15. Install completed assembly inside the unit, against the rear wall with the terminal block (E) facing the left side. Use #6x1/2 screws and large flat washers to secure swaged end of standoffs to the rear wall, using the old transistor mounting holes.

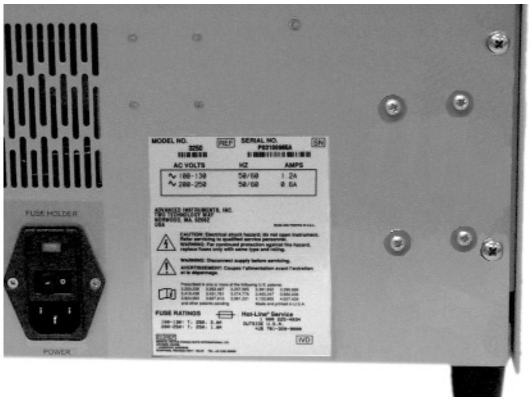
Note: *Newer instruments manufactured in 2005 may have a modified mounting (e.g., terminal block facing downward). See figures on next page for mounting configurations.*

16. Plug the old transistor lead holes, if any, using the ¼" plastic hole plugs (F).
17. Replace the instrument cover and connect the power cord.
18. Turn on the instrument and verify correct thermoelectric operation using the test utility "**A/D Test**" (see user's guide).

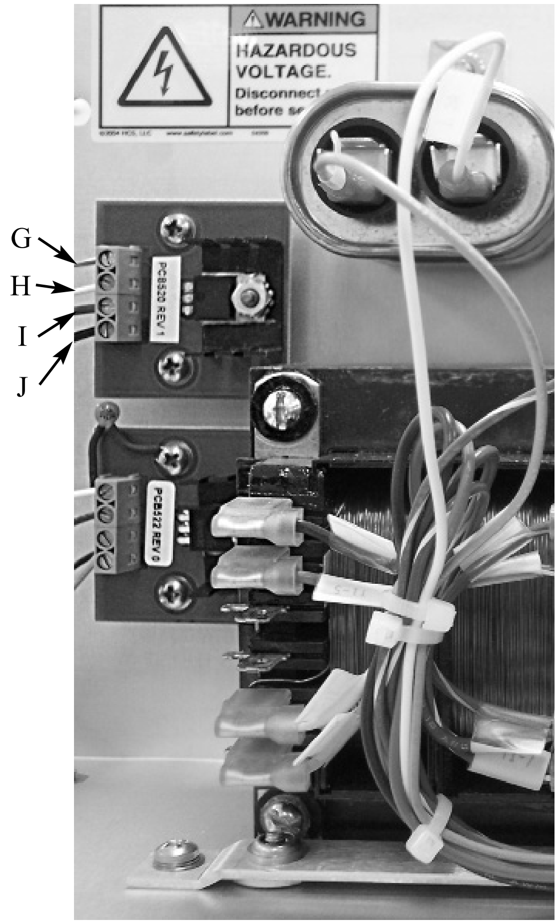
4C3 and 3900 Instruction:

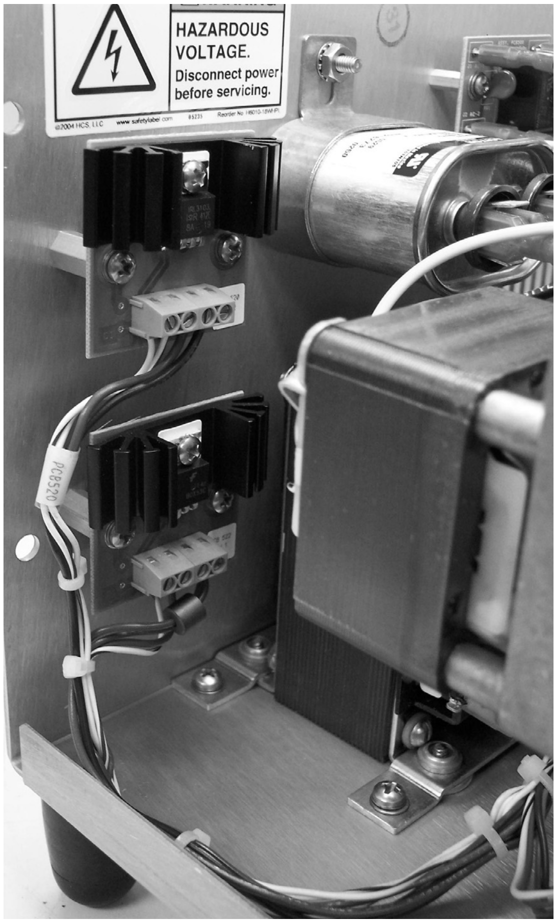
1. Turn off the instrument power and disconnect the power cord.
2. Remove the intrument rear cover.
3. Locate transistor Q3 on the transistor heat sink mounted to the bottom of the chassis. Q3 is the transistor 2nd from the left.
4. If your instrument already has PCB520 in this location, remove the old PCB and skip to step 12.
5. Remove the screws securing the heat sink to the chassis and gently lift out the heat sink.
6. Remove the screws holding the old transistor and insulating materials.
7. Remove the old transistor and insulating materials by gently prying with a flat-bladed screwdriver.
8. Remove the transistor socket Q3 from the heat sink and clear the mounting holes of any remaining hardware.
9. Cut transistor socket Q3 from harness 4C3160.
10. Strip wire insulation ¼" on four (4) wires formerly soldered to the transistor socket. Twist the stripped ends to prevent fraying.
11. Install the hex standoffs to PCB520 using #6x3/8 screws, with the flat end of the standoff against the board.
12. Connect red/white wire to terminal 1 (G).
13. Connect white/brown wire to terminal 2 (H).
14. Connect white/green wire to terminal 3 (I).
15. Connect black wire to terminal 4 (J).
16. Install completed assembly on the back side of the heat sink where the previous transistor socket was mounted. Use #6x1/2 screws and large flat washers to secure swaged end of standoffs to the heat sink, using the old transistor mounting holes. The ¼" plastic hole plugs are not used in this installation and may be discarded.
17. Replace the instrument cover and connect the power cord.
18. Turn on the instrument and verify correct thermoelectric operation using the test utility "**A/D Test**" (see user's guide).




FUSE HOLDER
POWER

Alternate Mounting Configuration
(see below)


WARNING
HAZARDOUS
VOLTAGE.
G
H
I
J
PCB520 REV 1
PCB522 REV 0


HAZARDOUS
VOLTAGE.
Disconnect power
before servicing.
PCB520

PCB522 Transistor Replacement Instruction
35050 to PCB522R Substitution
(Models 4D3, 3D3, 3250*, 4C3, 3900, and 4250*)

***Not for use on Models 3250/4250 with serial suffix D and higher.**

Reference: Use this instruction to install part PCB522R, which is intended as a direct replacement for part 35050 metal can Darlington transistor used on some of the above models.

Materials Included:

1 - PCB520 assembly
2 - H50606, #6x3/8 Sems
2 - H50608, #6x1/2 Sems
2 - H63093, #6 large flat washers
2 - 90049, Hex swage standoffs
2 - 91038, ¼” plastic hole plugs

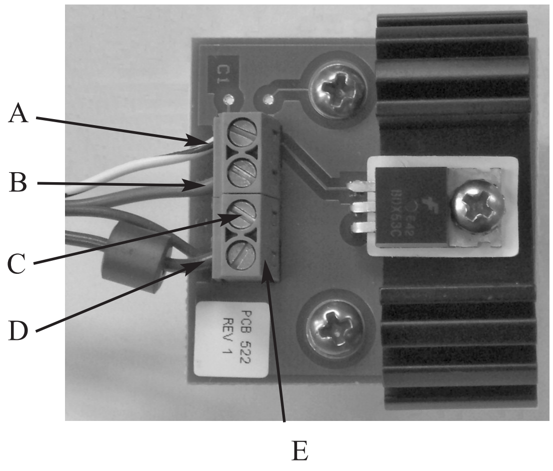
Tools Needed: Wire cutters, wire strippers, small flat-bladed screwdriver, medium Phillips screwdriver.

Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

4D3, 3D3, 3250, and 4250 Instruction:

1. Turn off the instrument power and disconnect the power cord.
2. Remove the intrument cover.
3. Locate transistor Q2B on left-rear of the chassis. Q2B is the transistor nearest to the bottom of the rear panel.
4. If your instrument already has PCB522 in this location, remove the old PCB and skip to step 11.
5. Remove the screws securing the protective black plastic cap on the outside rear of the instrument.
6. Remove the old transistor and insulating materials by gently prying with a flat-bladed screwdriver.
7. Remove the transistor socket Q2B from the rear panel and clear the mounting holes of any remaining hardware.
8. Cut transistor socket Q2B from harness M20150.
9. Strip wire insulation ¼” on four (4) wires formerly soldered to the transistor socket. Twist the stripped ends to prevent fraying.
10. Install the hex standoffs to PCB522 using #6x3/8 screws, with the flat end of the standoff against the board.
11. Connect white/blue wire to terminal 1 (A).
12. Connect violet wire to terminal 2 (B).
13. Terminal 3 (C) is unused.



14. Connect dark blue wire to terminal 4 (D).
15. Connect light blue wire to terminal 4 (D).

Note: *Make sure screw terminals are tight and that only bare wire, not insulation, is captured in the clamp.*

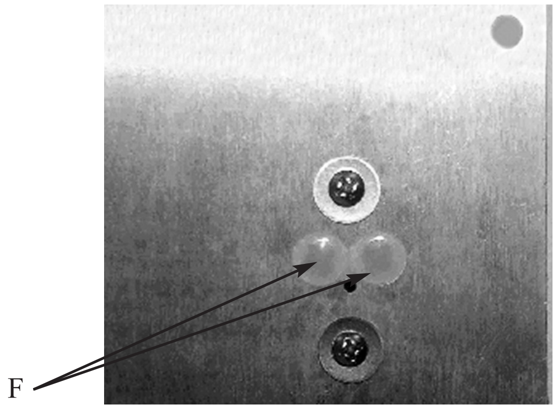
16. Install completed assembly inside the unit, against the rear wall with the terminal block (E) facing the left side. Use #6x1/2 screws and large flat washers to secure swaged end of standoffs to the rear wall, using the old transistor mounting holes.

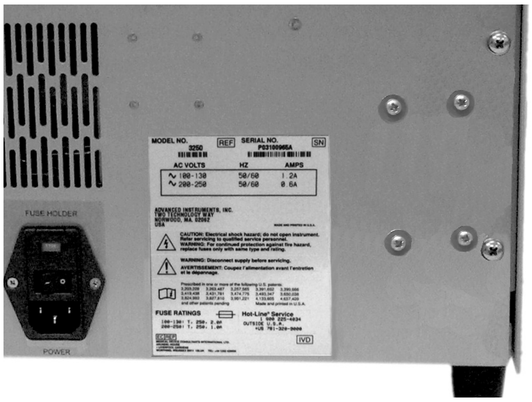
Note: *Newer instruments manufactured in 2005 may have a modified mounting (e.g., terminal block facing downward). See figures on next page for mounting configurations.*

17. Plug the old transistor lead holes, if any, using the ¼" plastic hole plugs (F).
18. Replace the instrument cover and connect the power cord.
19. Turn on the instrument and verify correct stir/freeze operation using the test utility "**Stir/Freeze Test**" (see user's guide).

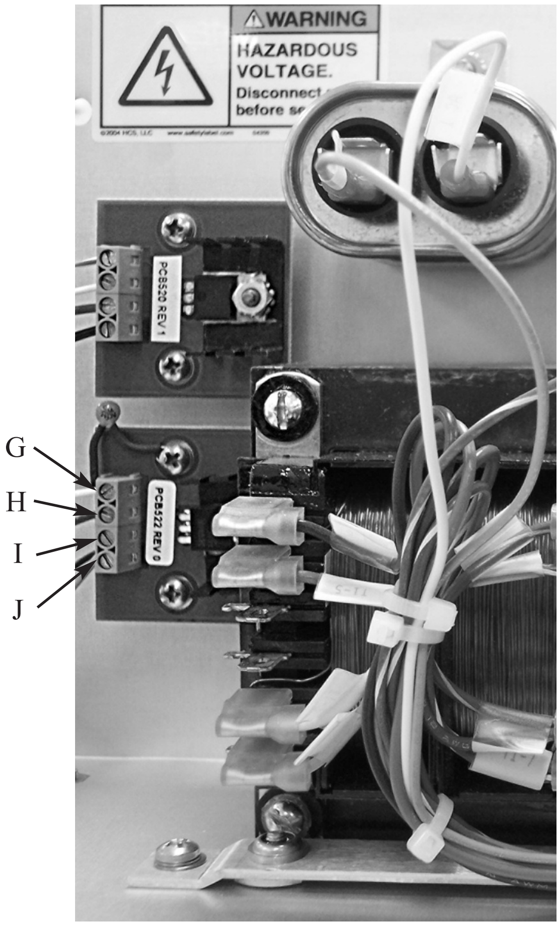
4C3 and 3900 Instruction:

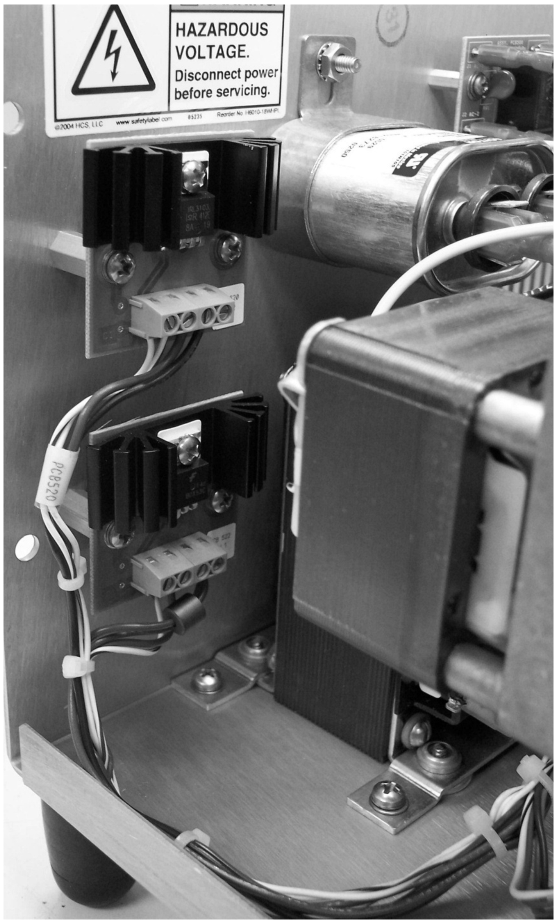
1. Turn off the instrument power and disconnect the power cord.
2. Remove the intrument rear cover.
3. Locate transistor Q2 on the transistor heat sink mounted to the bottom of the chassis. Q2 is the transistor 2nd from the right.
4. If your instrument already has PCB522 in this location, remove the old PCB and skip to step 12.
5. Remove the screws securing the heat sink to the chassis and gently lift out the heat sink.
6. Remove the screws holding the old transistor and insulating materials.
7. Remove the old transistor and insulating materials by gently prying with a flat-bladed screwdriver.
8. Remove the transistor socket Q2 from the heat sink and clear the mounting holes of any remaining hardware.
9. Cut transistor socket Q2 from harness 4C3160.
10. Strip wire insulation ¼" on four (4) wires formerly soldered to the transistor socket. Twist the stripped ends to prevent fraying.
11. Install the hex standoffs to PCB522 using #6x3/8 screws, with the flat end of the standoff against the board.
12. Connect white/blue wire to terminal 1 (G).
13. Connect violet/white wire to terminal 2 (H).
14. Terminal 3 (I) is unused.
15. Connect blue/red wire to terminal 4 (J).
16. Connect blue wire to terminal 4 (J).
17. Install completed assembly on the back side of the heat sink where the previous transistor socket was mounted. Use #6x1/2 screws and large flat washers to secure swaged end of standoffs to the heat sink, using the old transistor mounting holes. The ¼" plastic hole plugs are not used in this installation and may be discarded.
18. Replace the instrument cover and connect the power cord.
19. Turn on the instrument and verify correct stir/freeze operation using the test utility "**Stir/Freeze Test**" (see user's guide).




FUSE HOLDER
POWER

Alternate Mounting Configuration
(see below)


WARNING
HAZARDOUS VOLTAGE.
PCB520 REV 1
PCB522 REV 0
G
H
I
J


HAZARDOUS VOLTAGE.
Disconnect power before servicing.
PCB520

Tube Ejector Spring Replacement
3D3312R/4D3312

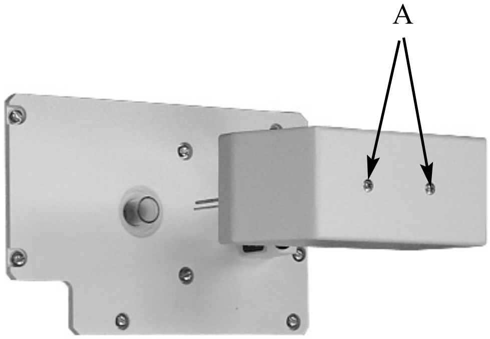
Reference: Use this instruction with replacement part 3D3312R or 4D3312.

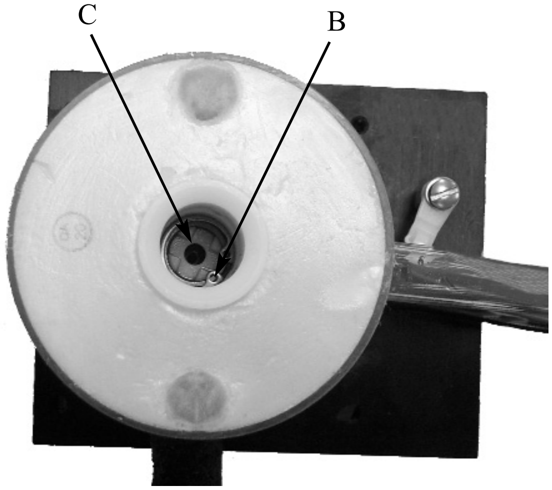
Tools Needed: Flat-bladed or Phillips screwdriver, Tru-arc pliers (for Osmometers).

⚠ **CAUTION:** Improper connections may cause damage to the instrument.

Osmometer Instruction:

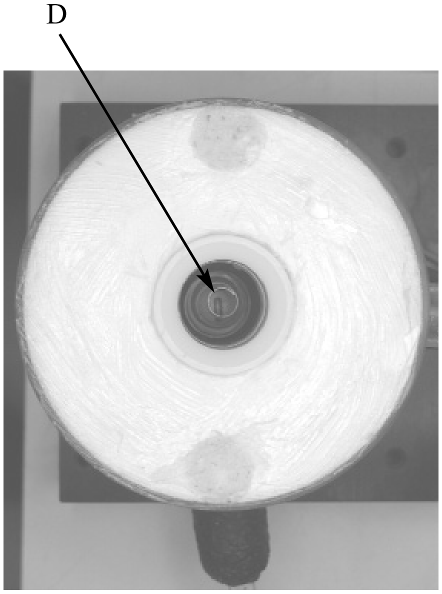
1. Turn off the power and unplug the instrument.
2. Remove the head cover screws (A), then remove the head cover.
3. Using a pair of Tru-arc pliers, remove the Tru-arc retainer ring (B) from inside the well.
4. Lift out the white Delrin elevator (C), and then the spring.
5. Replace the old spring with the new one and reassemble by reversing steps 1-4.





Cryoscope Instruction:

Remove the spring (D) from inside the well and replace it with the new spring, wide-end down.



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Yoke Replacement
3LH230R

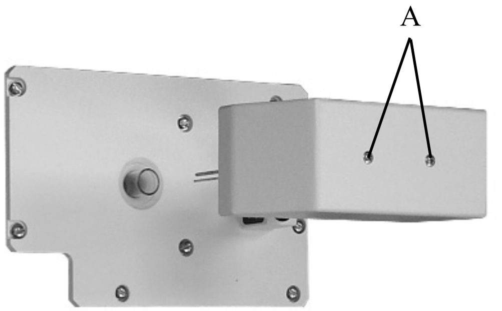
Reference: Use this instruction with replacement part 3LH230R.

Tools Needed: Phillips screwdriver, flat-bladed screwdriver, Allen wrench, probe alignment tool and instructions.

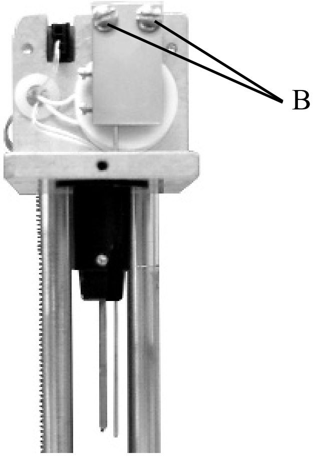
CAUTION: Improper connections may cause damage to the instrument.

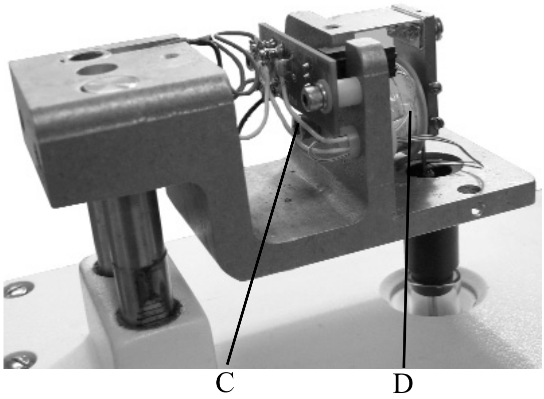
Instruction:

1. Turn off the power and unplug the instrument.
2. Remove the two screws from the head cover (A) and lift off the head cover.



3. Remove the two screws (B) that attach the clapper to the yoke and lift the clapper to remove it.
4. Remove the Allen screw (C) that attaches the yoke to the assembly and remove the coil (D).





5. Replace the old yoke with the new one, making sure the yoke is 90º and flush against the back wall of the head.
6. Reassemble by reversing steps 2-4.

Note: *Make sure the yoke level doesn't interfere with the head cover.*

7. Use the probe alignment tool and instructions to properly position the stir/freeze wire.

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Obsolete

Upgrade Kit, 3250/4250
Suffix D to E

Reference: Use this kit to upgrade a Model 3250 Osmometer or Model 4250 Cryoscope to Serial Suffix E.

Note: ***This upgrade may only be performed on a Serial Suffix D instrument. Serial Suffix C and earlier may not be upgraded.***

Tools Needed: Phillips screwdriver, small wire cutter, static grounding (earthing) wrist strap (included).

Warning-Hazardous Voltage

Warning-Internal components may be damaged by static electricity.

CAUTIONS:

- *Power cord must be disconnected to prevent electric shock.*
- *Never unpack, touch or handle any integrated circuit without wearing a grounding (earthing) strap to minimize your static charge.*
- *Instrument calibration and all customized settings will be lost when the main control board set or processor board is replaced. Therefore, make sure the current sample and block probe bin numbers and the sample stir amplitude are recorded in the service log so that you can reset these vital numbers into the replacement board set.*
- *Make sure that Option Switch Configuration is set for proper model selection.*

Kit Contents:

Qty	Part No.	Description
1	325250	Main harness
1	325605	Control board set
1	89900	Wrist strap, anti-static
4	TIW375	Tie wrap, 4-inch
1	325026PM	Label, updated to revision
1	325025PM	Instruction, Upgrade Kit 3250/4250 Suffix D to E

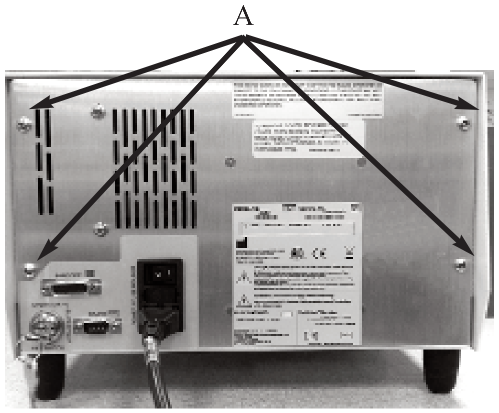
GENERAL INSTRUCTIONS:

1. Power up the instrument and record current sample and block probe bin numbers, sample stir amplitude, and any other customized settings that may need to be reset after this procedure.

Note: *Present settings may be found printed on unit initialization header during power-on sequence.*

2. When display shows "**Press START to Continue**", turn off the power and unplug the instrument.

3. Remove the screws securing the head cover, then remove the head cover. Remove the screws (A) securing the instrument cover, and remove the cover.



Obsolete

Note: *The printer cover should be released and open before removing the four screws (A) that release the instrument cover.*

4. Attach the static grounding strap to your wrist and stick the adhesive end to a suitable bare-metal ground, such as the rear panel.

Remove the Control Board Set:

1. Tilt the keypad forward to provide access and clearance to the printer assembly. Remove the installed paper roll from the printer assembly.

2. Remove all wiring connections to the application board (larger of two).

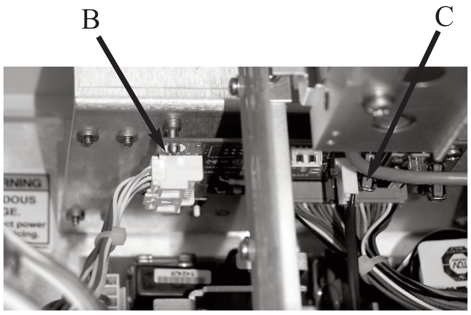
3. Gently pry the board set off the four snap-on standoffs.

Note: *Some instruments may require two screws be removed prior to removing the board set.*

Remove the Printer Assembly:

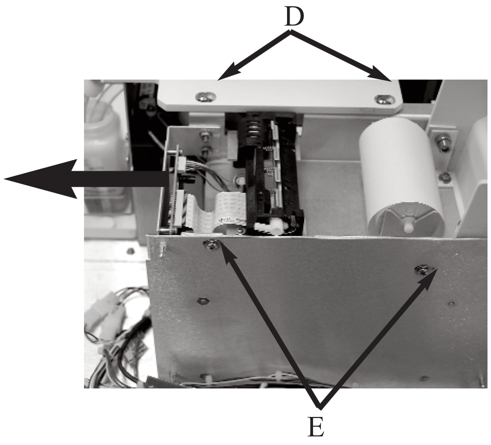
1. Locate the printer assembly mounted between the deck and the main PCB support. This includes the mounting bracket, the printer mechanism, printer control PCB, the printer interface PCB, and the interconnecting cable.

2. Release the cable end latch by pressing firmly on the cable end connector closest to the wires and disconnect the printer data cable (B) attached at the lower rear of the printer assembly, then disconnect the printer power connection (C) located in the middle side of the printer interface PCB, towards the sample cooling assembly and head.



3. Remove the two mounting screws (D) that attach the printer bracket to the deck.

4. Mark the front-to-back position of the mounting screws (E) that attach the printer bracket to the main PCB mounting bracket with a fine tip marker to assist during reassembly, then remove the two mounting screws.



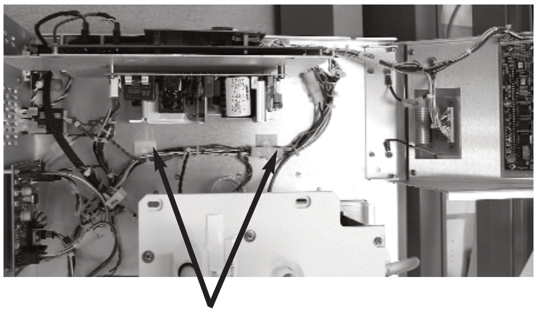
5. To remove the printer assembly, slide the printer assembly towards the front of the instrument until the printer bracket is clear of the deck. Set aside until reinstallation.

Main Harness Replacement:

1. Remove the two cable ties (F) that hold the main harness to the chassis. Remove the two cable ties dressing the connection to the head cable and cooling assembly.

2. Disconnect all of the main harness connectors still attached after being discon-

Obsolete



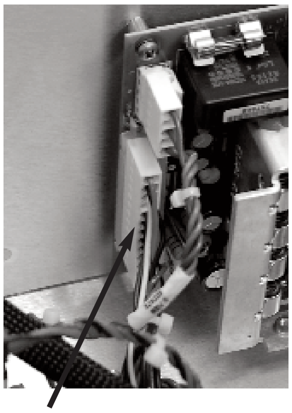
nected from the control board set, then remove the main harness.

Note: *Some of the connectors are latched and must have the latch released before disconnecting. Use care when disconnecting to avoid damage to the components and circuit boards.*

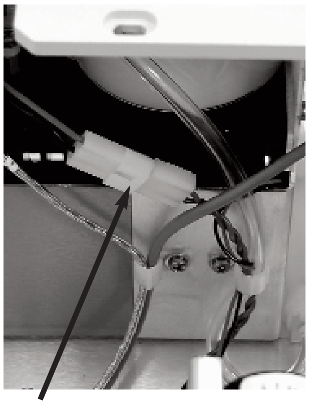
3. Visually examine the connector pins on the power supply. If there are any signs of discoloration to the header or if some of the pins do not appear shiny, contact the Advanced Instruments Service Center for replacement of the power supply.

4. Position the replacement main harness as shown, then connect all of the connectors. The connections to the control board set will be made after the replacement board set is installed.

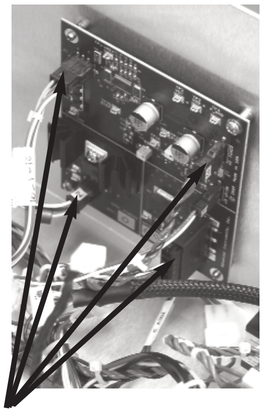
Note: *The force required to seat the power supply connector will be significantly greater than the old harness.*



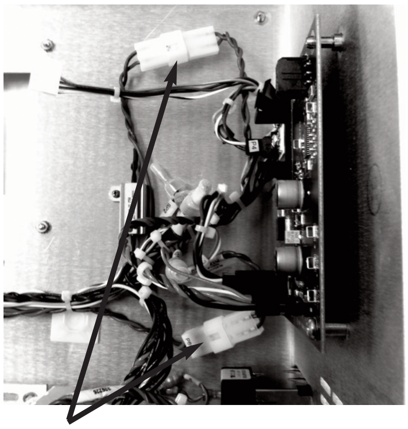
Power Supply Connection



Cooling Assembly Connections



Driver Board Connections



Load Resistor Connections

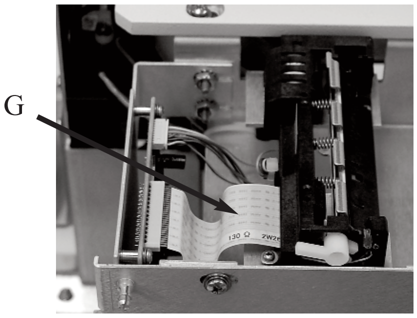
Obsolete

5. Secure the main harness in place using two cable ties. Dress the connections to the head cable and cooling assembly using two cable ties to prevent these wires from getting pinched by the keypad assembly when it is closed. Use a wire cutter to trim the cable ties.

Reinstall the Printer Assembly:

1. Install the printer assembly back into the instrument by guiding it back into position from the front of the instrument. Replace the printer bracket mounting screws, making sure to position the printer bracket as noted during the disassembly, earlier. This location is important to ensure proper alignment to the instrument cover.

2. Make sure the printer flex cable (G) is positioned as shown.



3. Connect the printer power connection (C) to the connector on the bottom of the printer interface board, then connect the printer data cable (B) to the connection at the lower rear of the printer assembly.

4. Return the keypad back to the normal position, making sure no wires are being pinched.

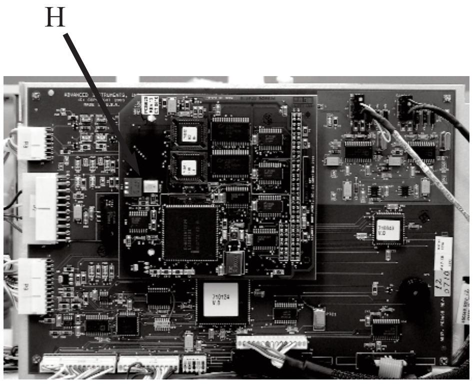
Install the Replacement Control Board Set:

1. Remove the replacement board set from its anti-static bag.

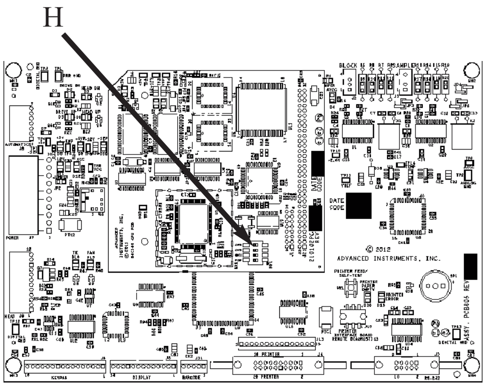
2. Check and confirm the correct setting of the options/configuration switch SW1 (H), located on the processor board (smaller of two).

   - For a 3250 with a 3-position switch, the settings should be **ON, ON, OFF**.
   - For a 4250 with a 3-position switch, the settings should be **OFF, ON, OFF**.
   - For a 3250 with a 4-position switch, the settings should be **OFF**, **ON, ON, OFF**.
   - For a 4250 with a 4-position switch, the settings should be **OFF, ON, OFF, OFF**.

Note: *Markings on switch body may vary:*
ON = 1 = CLOSED |
OFF = 0 = OPEN.



Two-Board Set



Updated Board Set

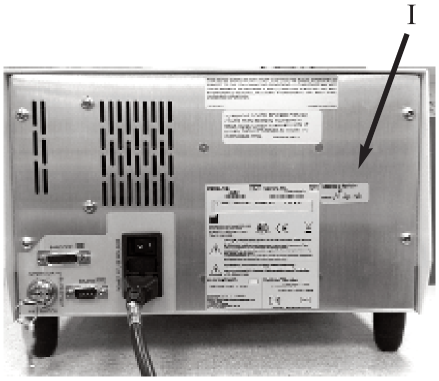
Obsolete

3. Press the new board set onto the four snap-on standoffs so that the words “Advanced Instruments, Inc.” are located in the upper left corner. Reinstall two screws, if applicable.

4. Reconnect all wiring connections, including the remaining connections on the main harness.

Final Steps:

1. Verify that all wiring connections have been restored, and that they are not offset on the mating board’s connector.



2. Remove the anti-static wrist strap.

3. Reinstall the instrument cover. Make sure to release the printer cover prior to securing the instrument cover with the four screws (A) in the rear panel. When tightening the four screws, make sure the opening in the instrument cover has clearance around the printer cover. Reinstall the head cover and secure with the two screws.

4. Place the “Updated to Revision E” label (I) as indicated. Write the date the update was completed.

5. Reinstall the paper roll in the printer per instructions in the User’s Guide. Close the printer cover.

6. Verify that the power switch is OFF, then reconnect the power cord.

7. Locate the Supervisor/Operator keyswitch on the rear of the instrument, then turn it to the Supervisor position (if required).

8. Turn on the instrument and verify that the instrument boots up correctly by watching the display and/or printout.

9. At “**Press START to Continue**”, press **SETUP**.

Note: *During the first start-up, you may see “A/D Cal Failure”. This is due to the board set powering up in an instrument for the first time. This error message may be ignored. The error message will clear and the display will return to “**Press START to Continue**”, where you would press **SETUP** again to enter the SETUP menu.*

10. Use the SETUP menu to reset the sample and block probe bin numbers and the sample stir amplitude, and any other customized settings.

11. To reset the serial number, cycle through the menu options by pressing < or > until you reach “**Serial Number**”, then press **START**. The display will read “**Serial#:**********”.

12. Press the following keys consecutively: **2, 4, CLEAR**, then enter each digit of the serial number as it appears on the label on the back of the instrument. (***Note**: The letter suffix at the end of the serial number will not be entered.*) When the number is correct, press **ENTER**.

13. The serial number will be recorded in memory and should appear the next time you power up your instrument.

Obsolete

14. Press **STOP** to exit the SETUP menu.

15. At "**Press START to Continue**", insert a sample tube containing water or calibration standard, then press **START** to initiate the instrument self-diagnostics.

Note: *During the first start-up, you may see "A/D Cal Failure". This is due to the board set powering up in an instrument for the first time. This error message may be ignored. The error message will clear and the display will return to "**Press START to Continue**", where you would press **START** again to initiate the instrument self-diagnostics.*

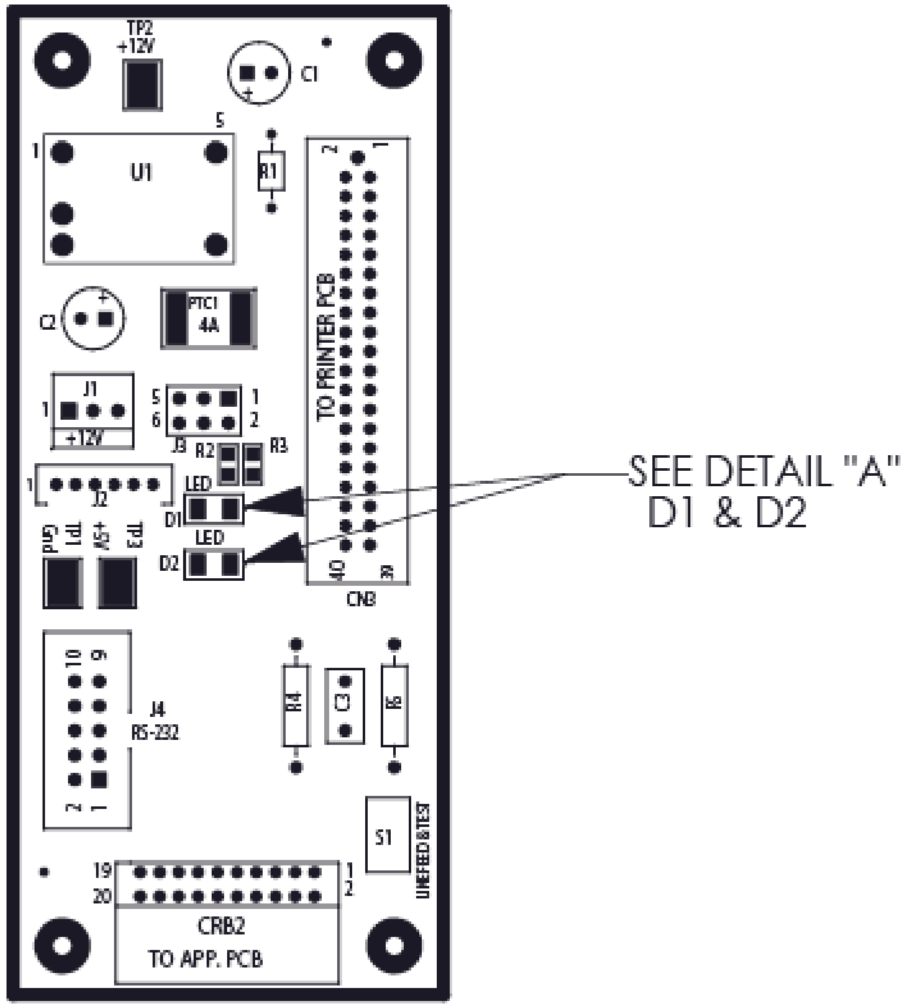
16. Once completed, the instrument will indicate "**Recalibration Needed**".

17. Recalibrate as prompted by the display and per the instructions in the User's Guide.

Note: *The results displayed during the calibration may be quite different from the calibration standards used, with negative values possible with the low calibrator. This is normal and should be ignored. Once the instrument has been fully calibrated, results observed during future calibrations will be much closer to the calibration standards.*

18. The upgrade to Suffix E is complete.

6. Schematics


TP2
+12V
C1
5
1
U1
R1
2
1
TO PRINTER PCB
C2
PTC1
4A
J1
1
+12V
5
6
1
2
J3
R2
R3
1
J2
LED
D1
LED
D2
Gnd
TP1
+5V
TP3
40
39
CN3
10
9
J4
RS-232
2
1
R4
C3
R6
S1
LINEFEED & TEST
19
20
1
2
CRB2
TO APP. PCB
SEE DETAIL "A"
D1 & D2

NOTES:

1. ALL MARKINGS TO BE IN BLACK INDELIBLE INK OR PERMANENT ADHESIVE LABEL. MARK DATE CODE VENDOR I.D. AND BOM REVISION LEVEL.

2. PCB ASSEMBLY TO BE BUILT AND INSPECTED PER IPC-A-610 CALSS 2.

3. BOARD TO BE ASSEMBLY IN COMPLIANCE WITH EU-RoHS DIRECTIVE.

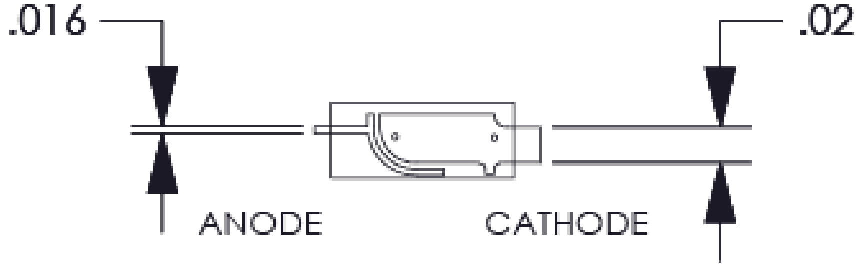
4. SOLDER: USE RoHS COMPLIANT SOLDER SPECIFIED ON ASSEMBLY BOM.

5. SHIP ASSEMBLED BOARDS IN ANTI-STATIC PACKAGING.

6. LED: D1 & D2 CATHODE IS INDICATED BY POINT IN SILKSCREEN. SEE DETAIL "A" FOR CATHODE LOCATION.

7. INSTALL SHUNT ITEM 19 ONTO J3 PINS 1 & 3 AND 2 & 4.

8. DO NOT INSTALL J4.


.016
.02
ANODE
CATHODE

DETAIL "A"

SCALE: NONE

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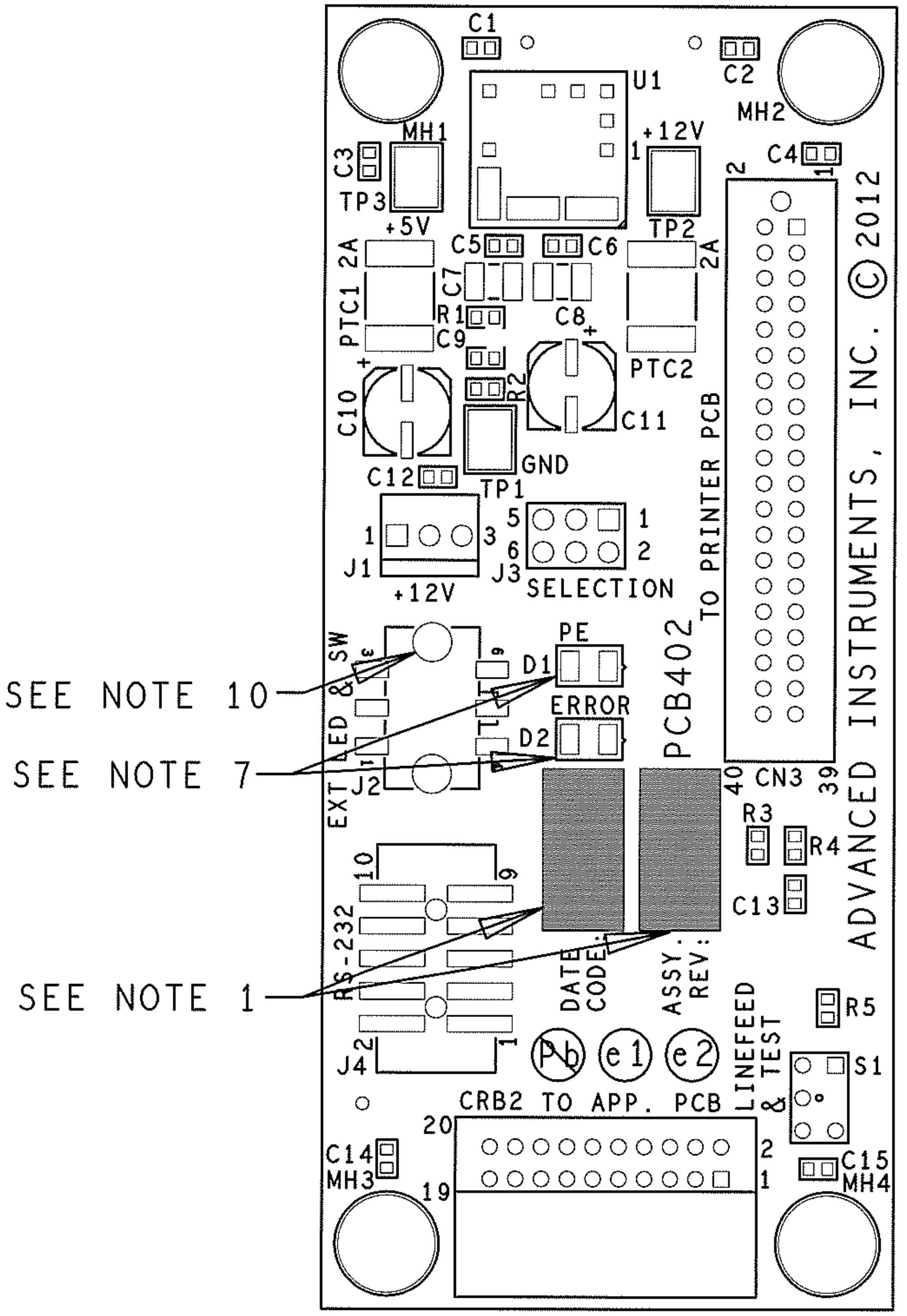
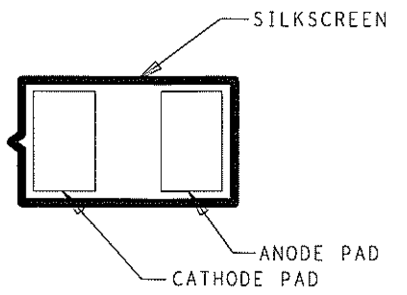
PCB402 Assembly Drawing Rev0


C1
U1
C2
MH2
MH1
+12V
C3
TP3
C4
+5V
C5
C6
TP2
PTC1 2A
2A
C7
R1
C8
C9
PTC2
C10
R2
C11
GND
C12
TP1
1
3
5
1
6
2
J1
+12V
J3
SELECTION
TO PRINTER PCB
ADVANCED INSTRUMENTS, INC. © 2012
PE
D1
ERROR
D2
PCB402
EXT LED & SW
J2
CN3
40
39
R3
R4
C13
RS-232
10
9
2
1
J4
DATE CODE:
ASSY. REV:
Pb
e1
e2
LINEFEED & TEST
R5
S1
CRB2 TO APP. PCB
20
19
2
1
C14
MH3
C15
MH4
SEE NOTE 10
SEE NOTE 7
SEE NOTE 1

ASSEMBLY TOP

DETAIL "A"


SILKSCREEN
ANODE PAD
CATHODE PAD

NOTES:

1. ALL MARKINGS TO BE IN BLACK INDELIBLE INK OR PERMANENT ADHESIVE LABEL. MARK DATE CODE, SUPPLIER IDENTIFICATION AND BOM REVISION LEVEL.
2. PCB ASSEMBLY TO BE BUILT AND INSPECTED TO IPC-A-610 CLASS 2.
3. BOARD TO BE ASSEMBLED IN COMPLIANCE WITH EU-RoHS DIRECTIVE.
4. SOLDER - USE RoHS COMPLIANT SOLDER SPECIFIED ON ASSEMBLY BOM.
5. SHIP ASSEMBLED BOARDS IN ANTI-STATIC PACKAGING.
6. THIS DOCUMENT PROVIDES A REFERENCE MECHANICAL VIEW ONLY. FOR DIMENSIONS REFER TO BOARD FABRICATION DRAWING. THIS DRAWING IS BASED ON THE ASSEMBLY TOP AND OR BOTTOM GERBER FILES AND IS NOT REPRESENTATIVE OF ANY OTHER STACKUP DOCUMENTATION. REFER TO THE SCHEMATIC, ORIGINAL GERBER FILES, REPORTS, ETC. FOR FURTHER INFORMATION.
7. CATHODE OF D1 & D2 IS PLACED AT SILKSCREEN POINT. SEE DETAIL "A" FOR CORRECT ORIENTATION OF D1 & D2.
8. INSTALL SHUNT ITEM 19 ONTO J3 PINS 1 & 3 AND 2 & 4.
9. DO NOT INSTALL J4.
10. SOLDER ALL CONNECTOR RETAINING CLIPS ON J2.

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THIS DOCUMENT CREATED USING ORCAD PCB V16.5

REFERENCE PROJECT FILE PCB402_1.BRD AND ASSOCIATED FILES

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON:
2 PL DECIMALS +/- .010
3 PL DECIMALS +/- .005
ANGLES +
FRACTIONS +

ADVANCED INSTRUMENTS, INC.
Two Technology Way
Norwood, MA 02062

TELEPHONE:(781)320-9000
FAX: (781)320-8181

DFT	N.IBANEZ	4.27.09	PRINTER INTERFACE BOARD ASSEMBLY		
CHKD	B.PYATT	4.30.09	NEXT ASSY. N/A	SCALE N/A	SIZE B
APPD	R.SOARES	4.30.09	SHEET 1 OF 1	DWG.NO. PCB402DG	REV. 1

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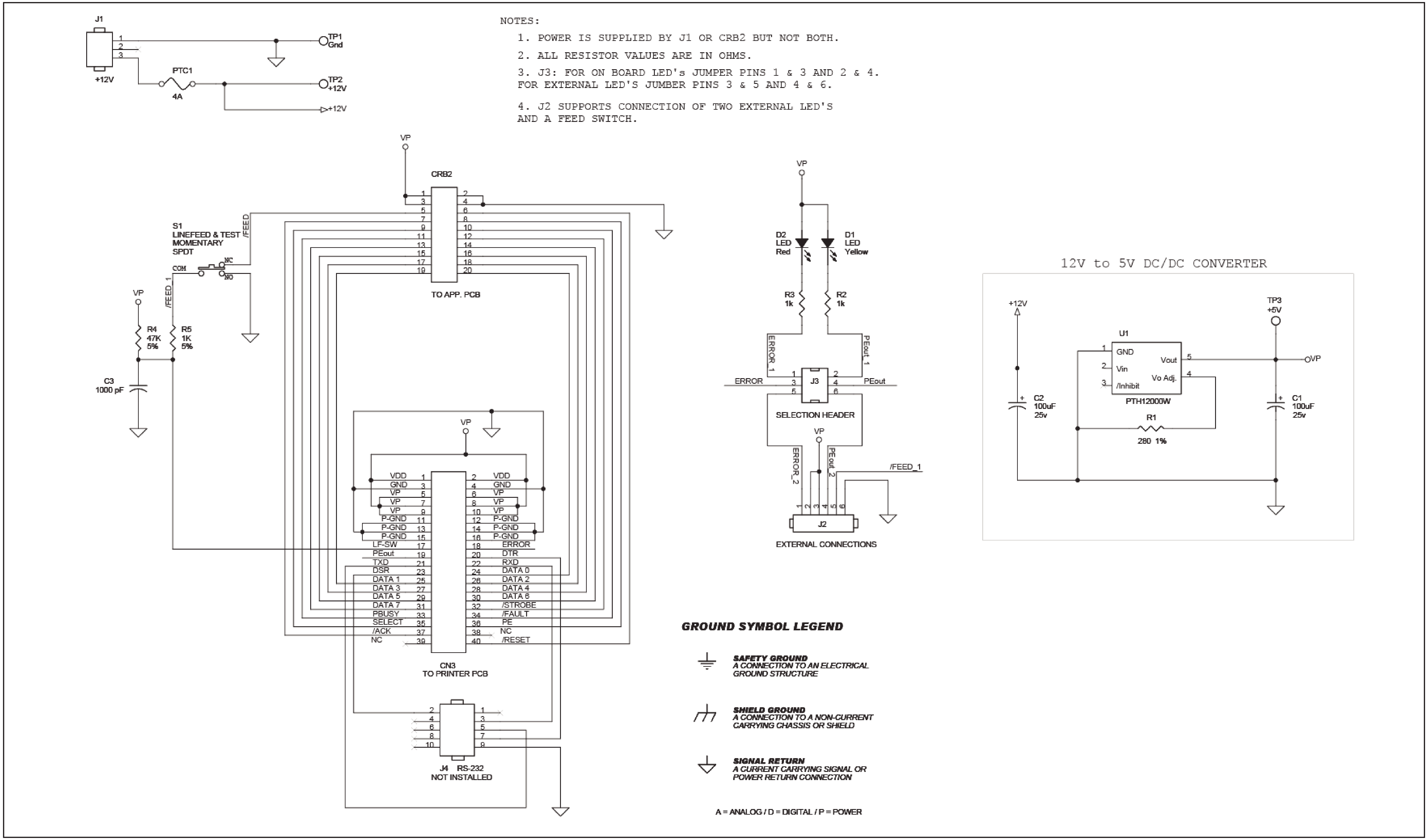
PCB402 Assembly Drawing Rev1


J1
+12V
PTC1
4A
TP1 Gnd
TP2 +12V
+12V
VP
CRB2
TO APP. PCB
S1 LINEFEED & TEST MOMENTARY SPDT
COM
NC
NO
/FEED
/FEED_1
R4 47K 5%
R5 1K 5%
C3 1000 pF
VDD
GND
VP
P-GND
LF-SW
PEout
TXD
DSR
DATA 1
DATA 3
DATA 5
DATA 7
PBUSY
SELECT
/ACK
NC
ERROR
DTR
RXD
DATA 0
DATA 2
DATA 4
DATA 6
/STROBE
/FAULT
PE
/RESET
CN3 TO PRINTER PCB
J4 RS-232 NOT INSTALLED
D2 LED Red
D1 LED Yellow
R3 1k
R2 1k
ERROR_1
PEout_1
J3
SELECTION HEADER
ERROR_2
PEout_2
J2
EXTERNAL CONNECTIONS
12V to 5V DC/DC CONVERTER
U1
GND
Vin
/Inhibit
Vout
Vo Adj.
PTH12000W
R1 280 1%
C2 100uF 25v
C1 100uF 25v
TP3 +5V

NOTES:

1. POWER IS SUPPLIED BY J1 OR CRB2 BUT NOT BOTH.
2. ALL RESISTOR VALUES ARE IN OHMS.
3. J3: FOR ON BOARD LED's JUMPER PINS 1 & 3 AND 2 & 4. FOR EXTERNAL LED'S JUMBER PINS 3 & 5 AND 4 & 6.
4. J2 SUPPORTS CONNECTION OF TWO EXTERNAL LED'S AND A FEED SWITCH.

GROUND SYMBOL LEGEND

SAFETY GROUND
A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE

SHIELD GROUND
A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD

SIGNAL RETURN
A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

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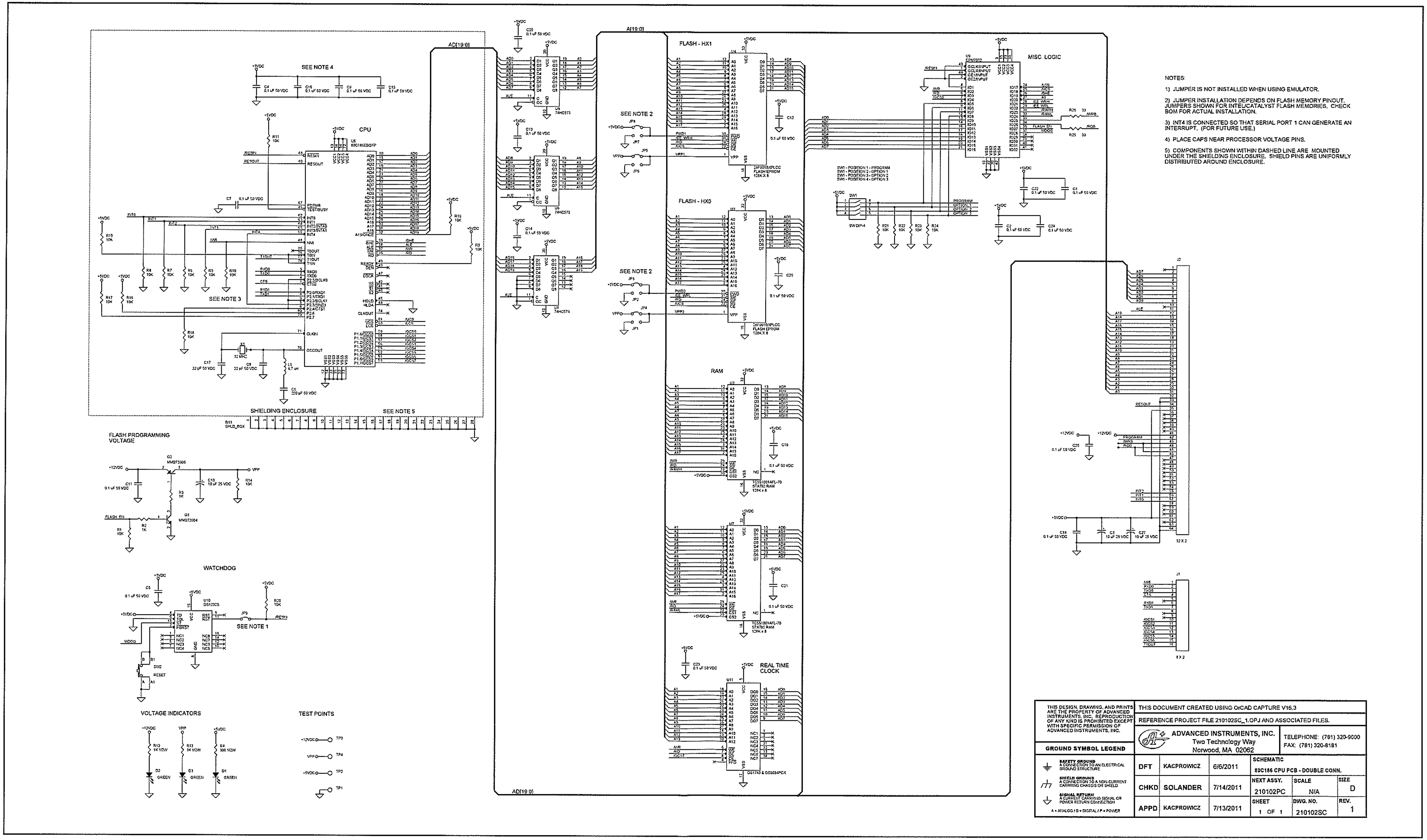
PCB402 Printer Interface Board Schematic Rev0


SEE NOTE 4
CPU
U5 80C186EC/PC
SEE NOTE 3
SHIELDING ENCLOSURE
SEE NOTE 5
FLASH PROGRAMMING VOLTAGE
WATCHDOG
SEE NOTE 1
VOLTAGE INDICATORS
TEST POINTS
FLASH - HX1
FLASH - HX0
SEE NOTE 2
SEE NOTE 2
RAM
REAL TIME CLOCK
MISC. LOGIC
SW1 - POSITION 1 - PROGRAM
SW1 - POSITION 2 - OPTION 1
SW1 - POSITION 3 - OPTION 2
SW1 - POSITION 4 - OPTION 3
J2
32 X 2
J1
8 X 2
AD[19:0]
A[19:0]

NOTES:

1) JUMPER IS NOT INSTALLED WHEN USING EMULATOR.

2) JUMPER INSTALLATION DEPENDS ON FLASH MEMORY PINOUT. JUMPERS SHOWN FOR INTEL/CATALYST FLASH MEMORIES. CHECK BOM FOR ACTUAL INSTALLATION.

3) INT4 IS CONNECTED SO THAT SERIAL PORT 1 CAN GENERATE AN INTERRUPT. (FOR FUTURE USE.)

4) PLACE CAPS NEAR PROCESSOR VOLTAGE PINS.

5) COMPONENTS SHOWN WITHIN DASHED LINE ARE MOUNTED UNDER THE SHIELDING ENCLOSURE. SHIELD PINS ARE UNIFORMLY DISTRIBUTED AROUND ENCLOSURE.

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THIS DOCUMENT CREATED USING OrCAD CAPTURE V16.3

REFERENCE PROJECT FILE 210102SC_1.OPJ AND ASSOCIATED FILES.

GROUND SYMBOL LEGEND

⏚ **SAFETY GROUND** A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE

SHIELD GROUND A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD

SIGNAL RETURN A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

ADVANCED INSTRUMENTS, INC.
Two Technology Way
Norwood, MA 02062
TELEPHONE: (781) 320-9000
FAX: (781) 320-8181

DFT	KACPROWICZ	6/6/2011	SCHEMATIC 80C186 CPU PCB - DOUBLE CONN.		
CHKD	SOLANDER	7/14/2011	NEXT ASSY. 210102PC	SCALE N/A	SIZE D
APPD	KACPROWICZ	7/13/2011	SHEET 1 OF 1	DWG. NO. 210102SC	REV. 1

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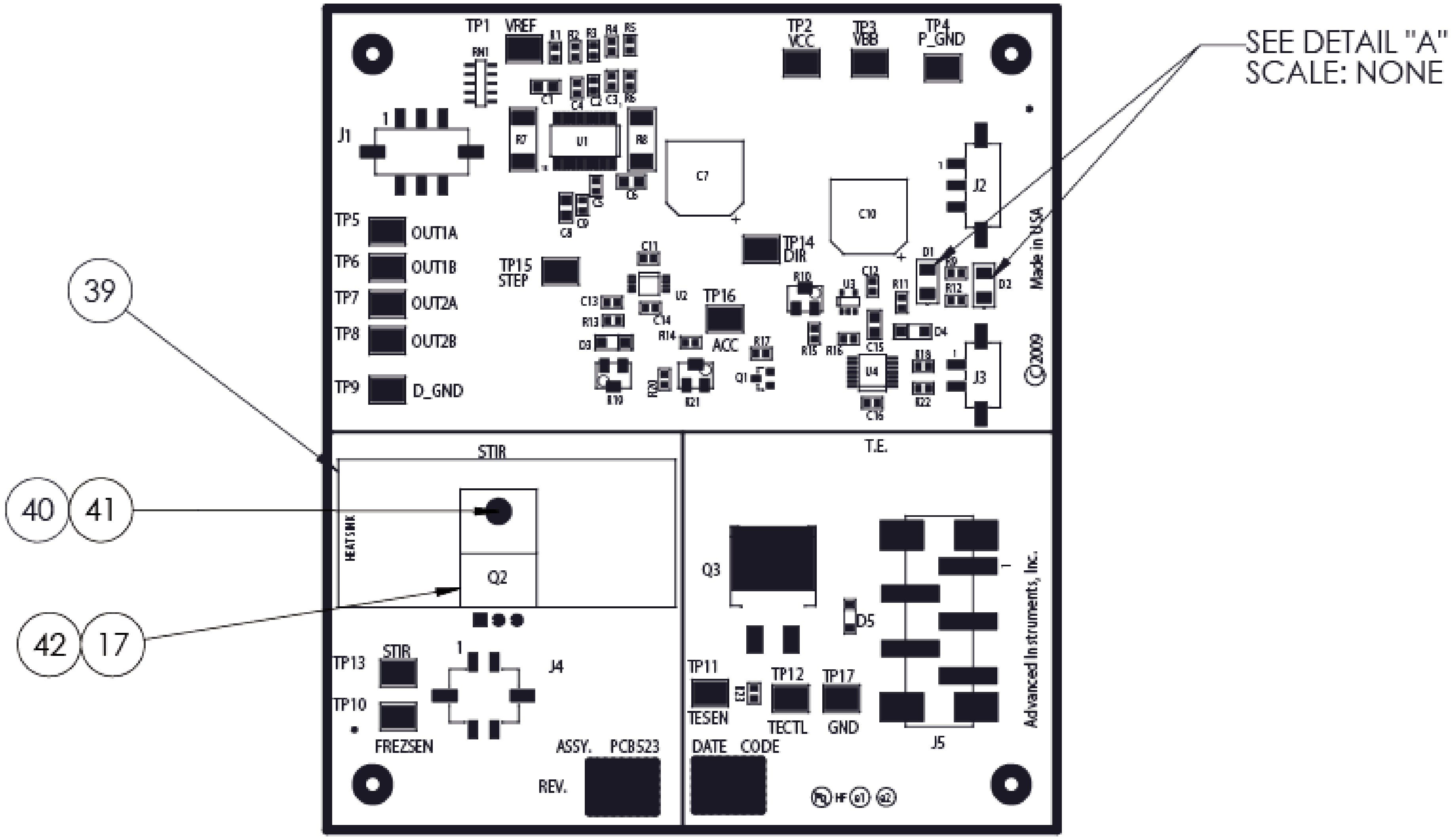
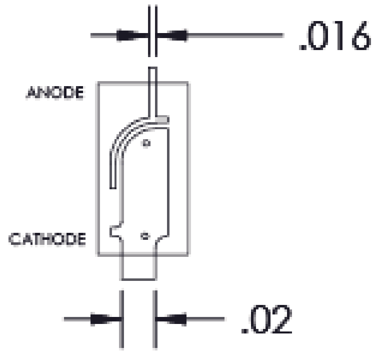
PCB402 Schematic Rev1


SEE DETAIL "A"
SCALE: NONE
39
40
41
42
17
TP1
VREF
RN1
R1
R2
R3
R4
R5
C1
C4
C2
C3
R6
R7
U1
R8
C5
C6
C7
C8
C9
TP2
VCC
TP3
VBB
TP4
P_GND
J1
1
J2
J3
C10
TP5
OUT1A
TP6
OUT1B
TP7
OUT2A
TP8
OUT2B
TP9
D_GND
TP15
STEP
TP14
DIR
C11
U2
C13
R13
C14
D3
R14
TP16
ACC
R17
Q1
R10
R20
R21
R19
R10
U3
C12
R11
R15
R16
C15
U4
C16
D1
R9
R12
D2
D4
R18
R22
Made in USA
©2009
STIR
HEATSINK
Q2
T.E.
Q3
D5
TP13
STIR
TP10
FREZSEN
J4
ASSY.
PCB523
REV.
TP11
TESEN
R23
TP12
TECTL
TP17
GND
DATE CODE
J5
Advanced Instruments, Inc.

NOTES:

1. ALL MARKINGS TO BE IN BLACK INDELIBLE INK OR PERMANENT ADHESIVE LABEL. MARK DATE CODE, VENDOR I.D. AND BOM REVISION LEVEL.
2. PCB ASSEMBLY TO BE BUILT AND INSPECTED PER IPC-A-610 CLASS 2.
3. BOARD TO BE ASSEMBLED IN COMPLIANCE WITH EU-RoHS DIRECTIVE.
4. SOLDER: USE RoHS COMPLIANT SOLDER SPECIFIED ON ASSEMBLY BOM.
5. SHIP ASSEMBLED BOARDS IN ANTI-STATIC PACKAGING.
6. LED: D1 & D2 CATHODE IS INDICATED BY POINT IN SILKSCREEN. SEE DETAIL "A" FOR CATHODE LOCATION.
7. NOT INSTALLED ON THIS REVISION: R14, R15, AND R19.


.016
ANODE
CATHODE
.02

DETAIL "A"

SCALE: NONE

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PRINTS ARE THE PROPERTY
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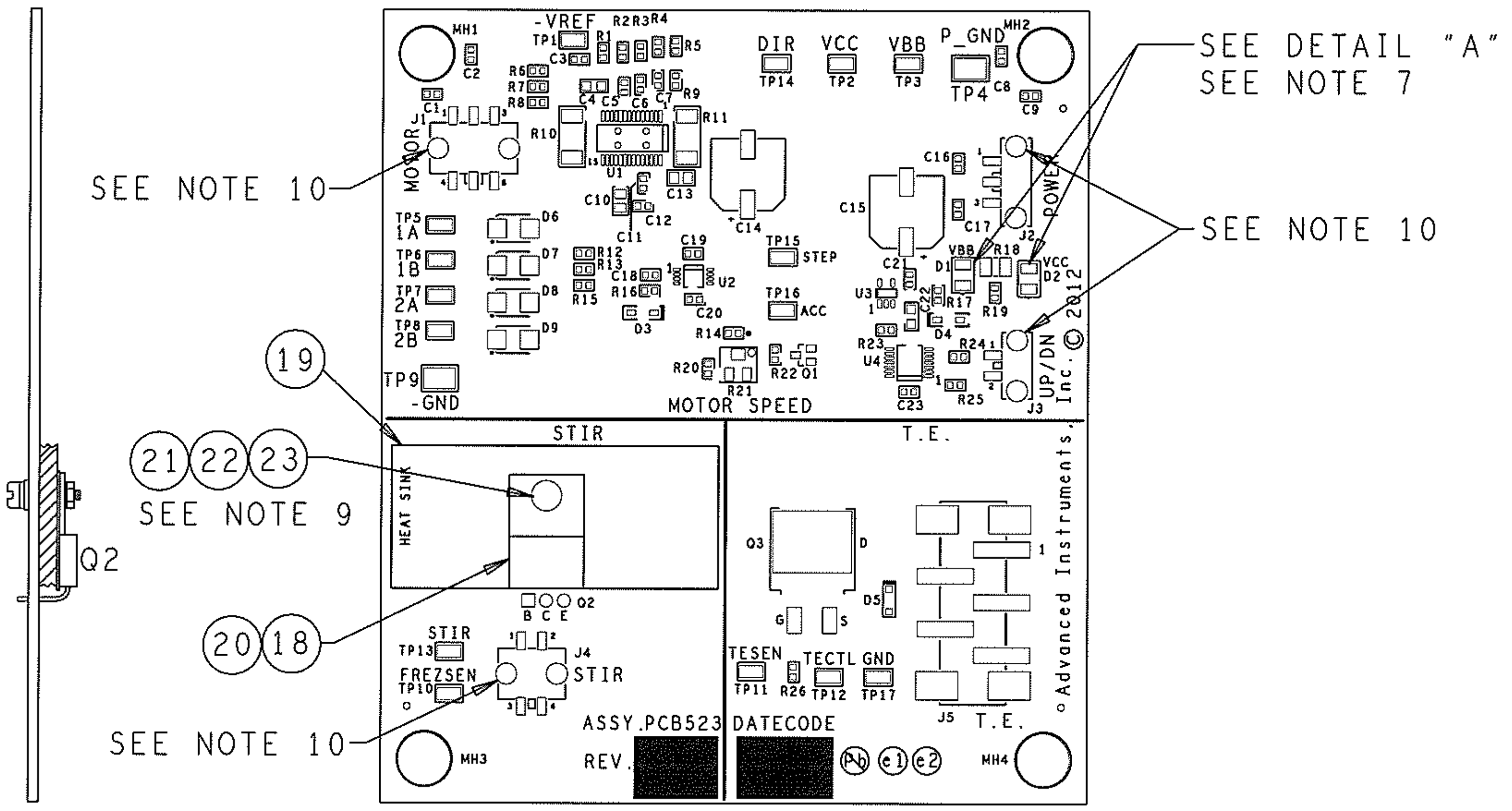
PCB523 Assembly Drawing Rev0

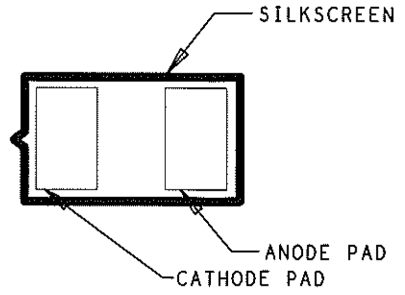

SEE DETAIL "A"
SEE NOTE 7
SEE NOTE 10
SEE NOTE 10
SEE NOTE 10
SEE NOTE 10
SEE NOTE 9
19
21
22
23
20
18
Q2
-VREF
DIR
VCC
VBB
P_GND
MOTOR
POWER
UP/DN
STIR
T.E.
HEAT SINK
MOTOR SPEED
TP9 -GND
TESEN
TECTL
GND
FREZSEN
ASSY.PCB523
REV.
DATECODE
Advanced Instruments, Inc. © 2012
MH1
MH2
MH3
MH4
J1
J2
J3
J4
J5
Q3
U1
U2
U3
U4

ASSEMBLY TOP

NOTES:

1. ALL MARKINGS TO BE IN BLACK INDELIBLE INK OR PERMANENT ADHESIVE LABEL. MARK DATE CODE, SUPPLIER IDENTIFICATION AND BOM REVISION LEVEL.
2. PCB ASSEMBLY TO BE BUILT AND INSPECTED TO IPC-A-610 CLASS 2.
3. BOARD TO BE ASSEMBLED IN COMPLIANCE WITH EU-RoHS DIRECTIVE.
4. SOLDER - USE RoHS COMPLIANT SOLDER SPECIFIED ON ASSEMBLY BOM.
5. SHIP ASSEMBLED BOARDS IN ANTI-STATIC PACKAGING.
6. THIS DOCUMENT PROVIDES A REFERENCE MECHANICAL VIEW ONLY. FOR DIMENSIONS REFER TO BOARD FABRICATION DRAWING. THIS DRAWING IS BASED ON THE ASSEMBLY TOP AND OR BOTTOM GERBER FILES AND IS NOT REPRESENTATIVE OF ANY OTHER STACKUP DOCUMENTATION. REFER TO THE SCHEMATIC, ORIGINAL GERBER FILES, REPORTS, ETC. FOR FURTHER INFORMATION.
7. LED: D1 & D2 CATHODE IS INDICATED BY POINT IN SILKSCREEN. SEE DETAIL "A" FOR CATHODE LOCATION.
8. NOT INSTALLED ON THIS REVISION: R14.
9. INSTALL ITEMS 18-23 AT Q2 AFTER AUTOMATED SOLDERING.
10. SOLDER ALL RETAINING CLIPS ON J1-J4.

DETAIL "A"


SILKSCREEN
ANODE PAD
CATHODE PAD

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THIS DOCUMENT CREATED USING ORCAD PCB V16.5

REFERENCE PROJECT FILE PCB523_2.BRD AND ASSOCIATED FILES

UNLESS OTHERWISE SPECIFIED

ADVANCED INSTRUMENTS, INC.
Two Technology Way
Norwood, MA 02062

TELEPHONE:(781)320-9000
FAX: (781)320-8181

DIMENSIONS ARE IN INCHES
TOLERANCES ON:
2 PL DECIMALS +/- .010
3 PL DECIMALS +/- .005
ANGLES +
FRACTIONS +

DFT	N.IBANEZ	04.30.09	DWG, DRIVER PCB ASSEMBLY
CHKD	B.PYATT	05.01.09	NEXT ASSY. PCB523 / SCALE N/A / SIZE B
APPD	B.SOARES	05.05.09	SHEET 1 OF 1 / DWG.NO. PCB523DG / REV. 4

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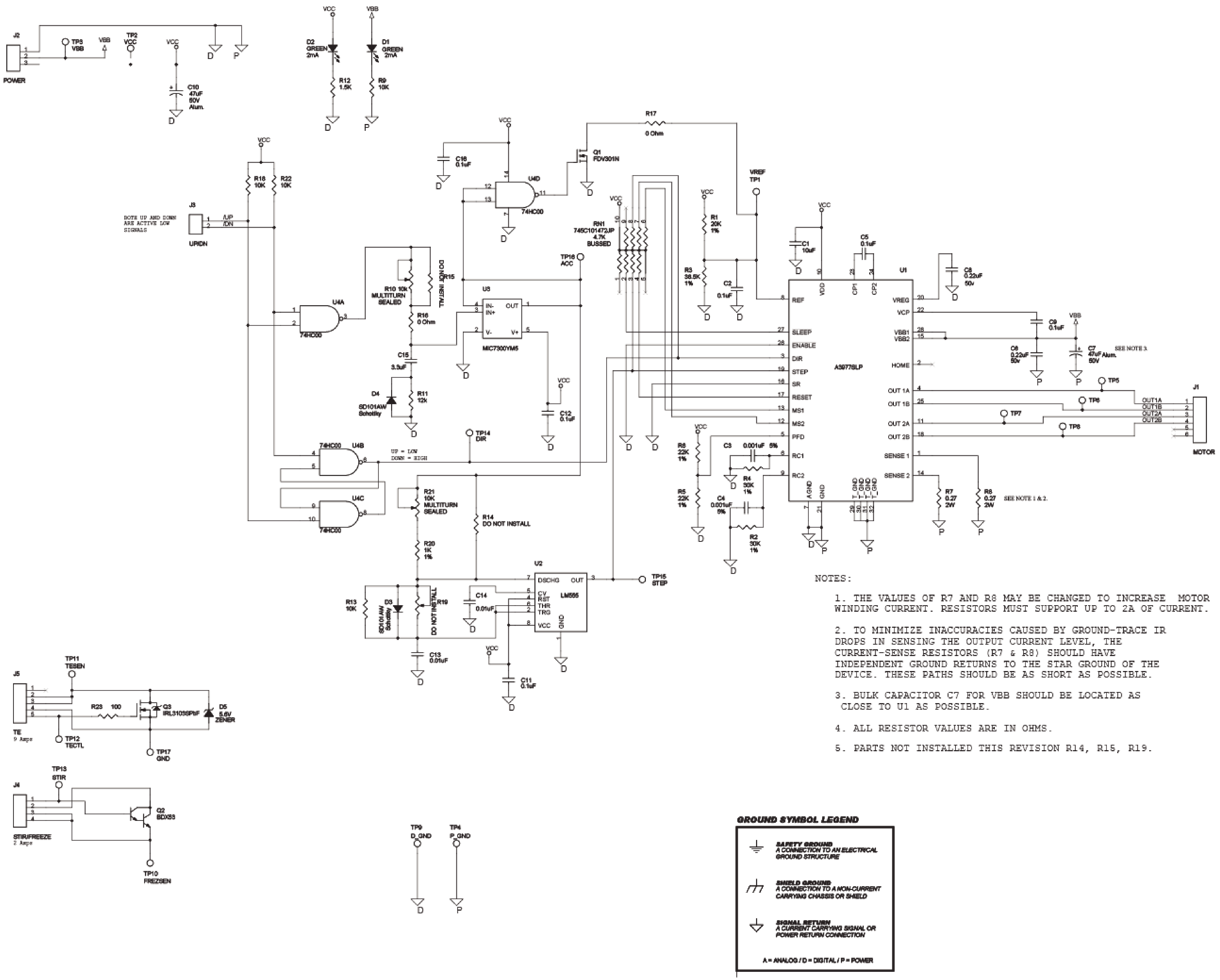
J2
POWER
TP3 VBB
TP2 VCC
VCC
VBB
C10 47uF 50V Alum.
D2 GREEN 2mA
D1 GREEN 2mA
R12 1.5K
R9 10K
R18 10K
R22 10K
J3
UP/DN
/UP
/DN
BOTH UP AND DOWN ARE ACTIVE LOW SIGNALS
U4A 74HC00
U4B 74HC00
U4C 74HC00
U4D 74HC00
R10 10K MULTITURN SEALED
R15 DO NOT INSTALL
R16 0 Ohm
C15 3.3uF
D4 SD101AW Schottky
R11 12k
U3 MIC7300YM5
IN- IN+ OUT V- V+
C12 0.1uF
C16 0.1uF
Q1 FDV301N
R17 0 Ohm
TP16 ACC
TP14 DIR
UP = LOW DOWN = HIGH
RN1 74SC101472JP 4.7K BUSSED
R1 20K 1%
R3 38.5K 1%
C2 0.1uF
VREF TP1
C1 10uF
C5 0.1uF
C8 0.22uF 50v
U1 A3977SLP
REF SLEEP ENABLE DIR STEP SR RESET MS1 MS2 PFD RC1 RC2
VDD CP1 CP2 VREG VCP VBB1 VBB2 HOME OUT 1A OUT 1B OUT 2A OUT 2B SENSE 1 SENSE 2
AGND GND P_GND
C9 0.1uF
C6 0.22uF 50v
C7 47uF Alum. 50V
SEE NOTE 3.
TP5 TP6 TP7 TP8
J1
OUT1A OUT1B OUT2A OUT2B
MOTOR
R6 22K 1%
R5 22K 1%
C3 0.001uF 5%
R4 30K 1%
C4 0.001uF 5%
R2 30K 1%
R7 0.27 2W
R8 0.27 2W
SEE NOTE 1 & 2.
R21 10K MULTITURN SEALED
R14 DO NOT INSTALL
R20 1K 1%
U2 LM555
DSCHG OUT CV RST THR TRG VCC GND
TP15 STEP
R13 10K
D3 SD101AW Schottky
R19 DO NOT INSTALL
C14 0.01uF
C13 0.01uF
C11 0.1uF
J5
TE 9 Amps
TP11 TESEN
TP12 TECTL
R23 100
Q3 IRL3103SPbF
D5 5.6V ZENER
TP17 GND
J4
STIR/FREEZE 2 Amps
TP13 STIR
Q2 BDX53
TP10 FREZSEN
TP9 D_GND
TP4 P_GND
D
P

NOTES:

1. THE VALUES OF R7 AND R8 MAY BE CHANGED TO INCREASE MOTOR WINDING CURRENT. RESISTORS MUST SUPPORT UP TO 2A OF CURRENT.

2. TO MINIMIZE INACCURACIES CAUSED BY GROUND-TRACE IR DROPS IN SENSING THE OUTPUT CURRENT LEVEL, THE CURRENT-SENSE RESISTORS (R7 & R8) SHOULD HAVE INDEPENDENT GROUND RETURNS TO THE STAR GROUND OF THE DEVICE. THESE PATHS SHOULD BE AS SHORT AS POSSIBLE.

3. BULK CAPACITOR C7 FOR VBB SHOULD BE LOCATED AS CLOSE TO U1 AS POSSIBLE.

4. ALL RESISTOR VALUES ARE IN OHMS.

5. PARTS NOT INSTALLED THIS REVISION R14, R15, R19.

GROUND SYMBOL LEGEND

SAFETY GROUND
A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE

SHIELD GROUND
A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD

SIGNAL RETURN
A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

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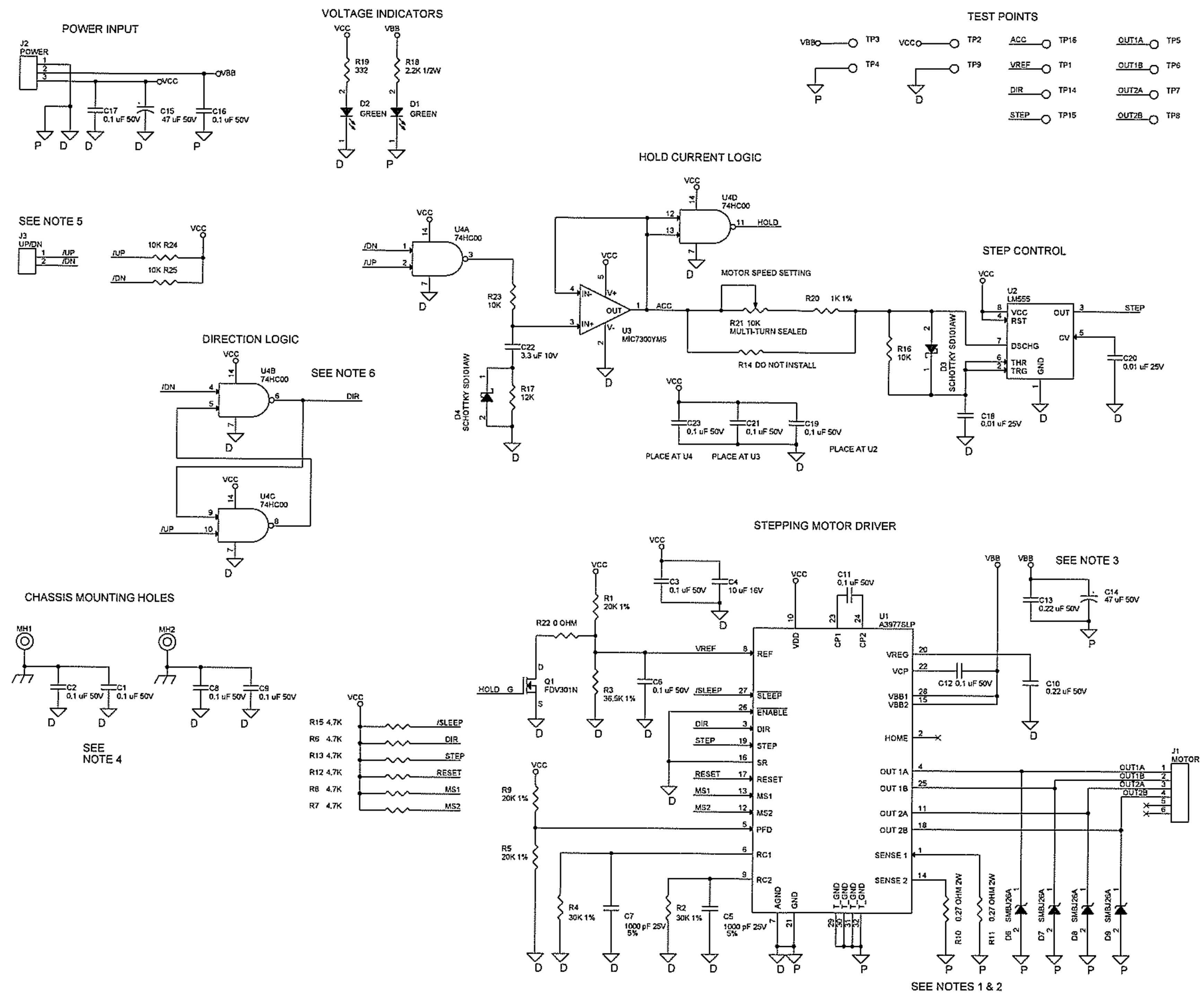
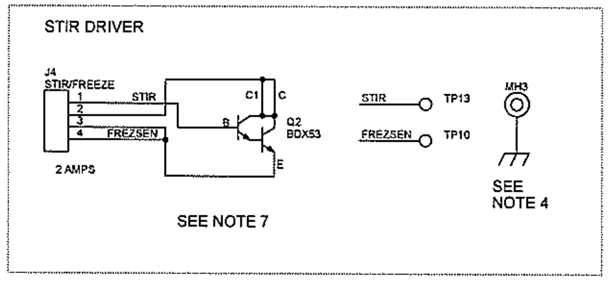
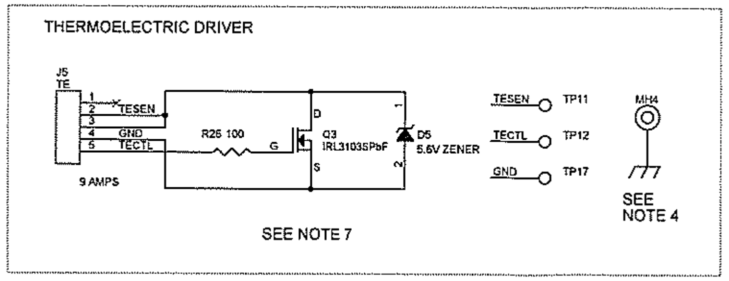
PCB523 Driver Board Schematic Rev0


POWER INPUT
J2 POWER
VBB
VCC
C17 0.1 uF 50V
C15 47 uF 50V
C16 0.1 uF 50V
VOLTAGE INDICATORS
R19 332
R18 2.2K 1/2W
D2 GREEN
D1 GREEN
TEST POINTS
VBB TP3
VCC TP2
ACC TP16
OUT1A TP5
TP4
TP9
VREF TP1
OUT1B TP6
DIR TP14
OUT2A TP7
STEP TP15
OUT2B TP8
HOLD CURRENT LOGIC
U4D 74HC00
HOLD
SEE NOTE 5
J3 UP/DN
/UP
/DN
10K R24
10K R25
U4A 74HC00
R23 10K
C22 3.3 uF 10V
D4 SCHOTTKY SD101AW
R17 12K
U3 MIC7300YMS
ACC
MOTOR SPEED SETTING
R21 10K MULTI-TURN SEALED
R20 1K 1%
R14 DO NOT INSTALL
C23 0.1 uF 50V
C21 0.1 uF 50V
C19 0.1 uF 50V
PLACE AT U4
PLACE AT U3
PLACE AT U2
STEP CONTROL
U2 LM555
R16 10K
D3 SCHOTTKY SD101AW
C18 0.01 uF 25V
C20 0.01 uF 25V
STEP
DIRECTION LOGIC
U4B 74HC00
SEE NOTE 6
DIR
U4C 74HC00
CHASSIS MOUNTING HOLES
MH1
MH2
C2 0.1 uF 50V
C1 0.1 uF 50V
C8 0.1 uF 50V
C9 0.1 uF 50V
SEE NOTE 4
STEPPING MOTOR DRIVER
C3 0.1 uF 50V
C4 10 uF 16V
C11 0.1 uF 50V
U1 A3977SLP
R1 20K 1%
R22 0 OHM
HOLD
Q1 FDV301N
R3 36.5K 1%
C6 0.1 uF 50V
C12 0.1 uF 50V
C10 0.22 uF 50V
SEE NOTE 3
C13 0.22 uF 50V
C14 47 uF 50V
R15 4.7K
R6 4.7K
R13 4.7K
R12 4.7K
R8 4.7K
R7 4.7K
/SLEEP
DIR
STEP
RESET
MS1
MS2
R9 20K 1%
R5 20K 1%
R4 30K 1%
C7 1000 pF 25V 5%
R2 30K 1%
C5 1000 pF 25V 5%
J1 MOTOR
OUT1A
OUT1B
OUT2A
OUT2B
R10 0.27 OHM 2W
R11 0.27 OHM 2W
D6 SMBJ26A
D7 SMBJ26A
D8 SMBJ26A
D9 SMBJ26A
SEE NOTES 1 & 2


STIR DRIVER
J4 STIR/FREEZE
STIR
FREZSEN
C1
Q2 BDX53
2 AMPS
STIR TP13
FREZSEN TP10
MH3
SEE NOTE 4
SEE NOTE 7


THERMOELECTRIC DRIVER
J5 TE
TESEN
GND
TECTL
R26 100
Q3 IRL3103SPbF
D5 5.6V ZENER
9 AMPS
TESEN TP11
TECTL TP12
GND TP17
MH4
SEE NOTE 4
SEE NOTE 7

NOTES:

1) SENSE RESISITOR VALUES MAY BE CHANGED TO INCREASE MOTOR WINDING CURRENT. RESISTORS MUST SUPPORT UP TO 2A OF CURRENT.

2) TO MINIMIZE INACCURACIES CAUSED BY GROUND-TRACE IR DROPS IN SENSING THE OUTPUT CURRENT, THE CURRENT-SENSE RESISTORS SHOULD HAVE INDEPENDENT GROUND RETURNS TO THE STAR GROUND OF THE DEVICE. THESE PATHS SHOULD BE AS SHORT AS POSSIBLE.

3) BULK CAPACITOR FOR VBB SHOULD BE LOCATED AS CLOSE TO U1 AS POSSIBLE.

4) CHASSIS MOUNTING HOLES ARE CONNECTED TO SHIELD GROUND VIA MOUNTING SCREWS.

5) BOTH UP AND DOWN ARE ACTIVE LOW SIGNALS.

6) DIR OUTPUT:
UP = LOW
DOWN = HIGH

7) ISOLATE THESE COMPONENTS ON OWN QUADRANT OF BOARD.

8) RESISTORS ARE 1/10W 5% UNLESS OTHERWISE NOTED.

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REFERENCE PROJECT FILE PCB523_SCH_2.OPJ AND ASSOCIATED FILES.

GROUND SYMBOL LEGEND

SAFETY GROUND A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE

SHIELD GROUND A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD

SIGNAL RETURN A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

ADVANCED INSTRUMENTS, INC.
Two Technology Way
Norwood, MA 02062

TELEPHONE: (781) 320-9000
FAX: (781) 320-8181

DFT	D. SOLANDER	04/29/2009	SCHEMATIC DRIVER PCB		
CHKD	M. KACPROWICZ	04/29/2009	NEXT ASSY. N/A	SCALE N/A	SIZE C
APPD	D. SOLANDER	04/29/2009	SHEET 1 OF 1	DWG. NO. PCB523_SCH	REV. 2

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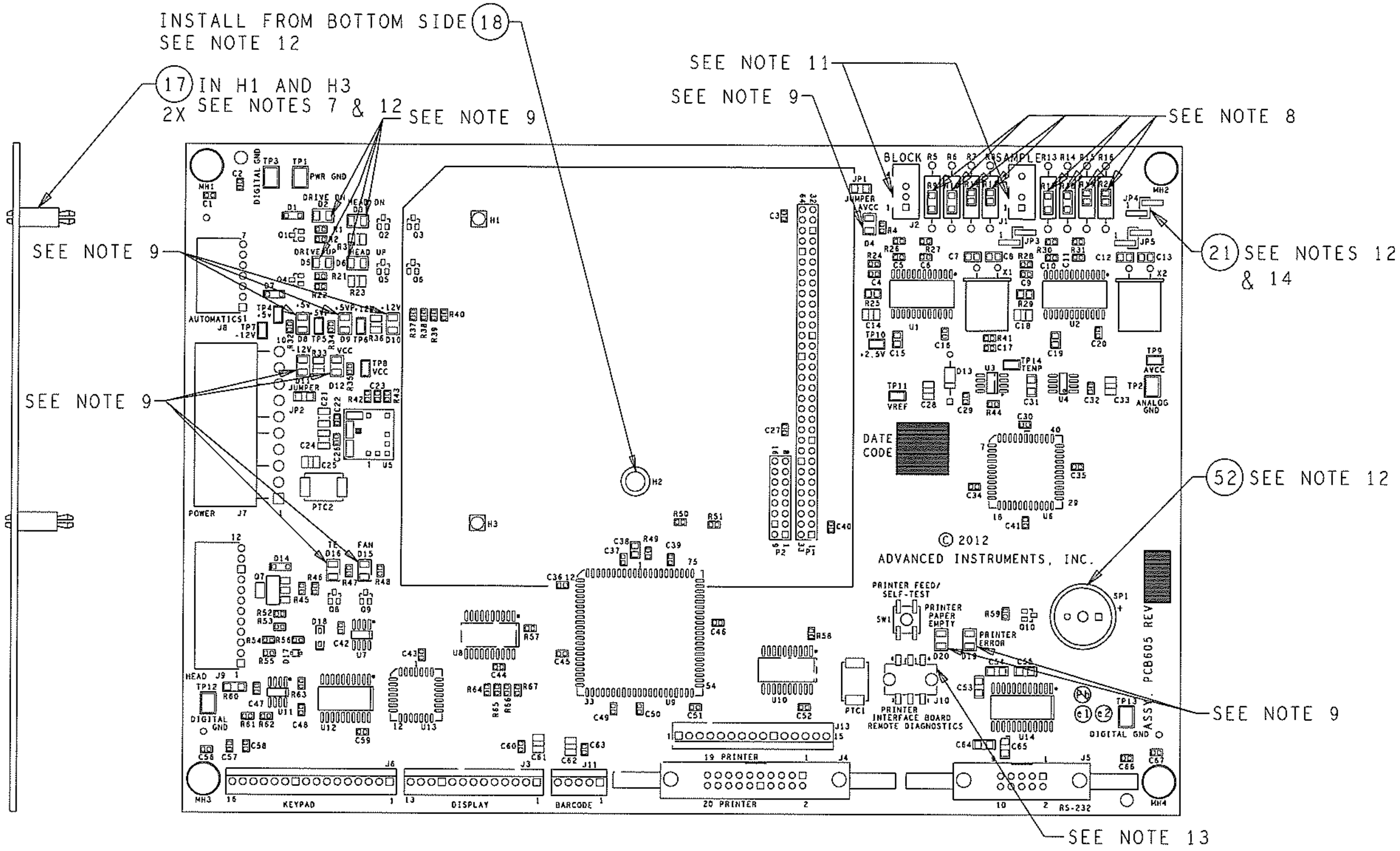
PCB523 Schematic Rev2

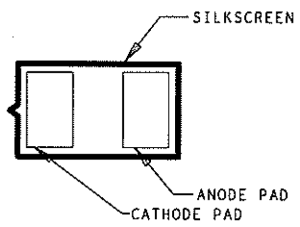

INSTALL FROM BOTTOM SIDE (18)
SEE NOTE 12
(17) IN H1 AND H3
2X SEE NOTES 7 & 12
SEE NOTE 9
SEE NOTE 11
SEE NOTE 9
SEE NOTE 8
SEE NOTE 9
SEE NOTE 9
(21) SEE NOTES 12 & 14
(52) SEE NOTE 12
SEE NOTE 9
SEE NOTE 13
DATE CODE
© 2012
ADVANCED INSTRUMENTS, INC.
ASSY. PCB605 REV
KEYPAD
DISPLAY
BARCODE
20 PRINTER
19 PRINTER
RS-232
POWER
AUTOMATICS
HEAD
DIGITAL GND
PWR GND
ANALOG GND
PRINTER FEED/ SELF-TEST
PRINTER PAPER EMPTY
PRINTER ERROR
PRINTER INTERFACE BOARD REMOTE DIAGNOSTICS
BLOCK
SAMPLE
JUMPER AVCC
FAN

ASSEMBLY TOP

NOTES:

1. ALL MARKINGS TO BE IN BLACK INDELIBLE INK OR PERMANENT ADHESIVE LABEL. MARK DATE CODE, SUPPLIER IDENTIFICATION AND BOM REVISION LEVEL.
2. PCB ASSEMBLY TO BE BUILT AND INSPECTED TO IPC-A-610 CLASS 2.
3. BOARD TO BE ASSEMBLED IN COMPLIANCE WITH EU-RoHS DIRECTIVE.
4. SOLDER - USE RoHS COMPLIANT SOLDER SPECIFIED ON ASSEMBLY BOM.
5. SHIP ASSEMBLED BOARDS IN ANTI-STATIC PACKAGING.
6. THIS DOCUMENT PROVIDES A REFERENCE MECHANICAL VIEW ONLY. FOR DIMENSIONS REFER TO BOARD FABRICATION DRAWING. THIS DRAWING IS BASED ON THE ASSEMBLY TOP AND OR BOTTOM GERBER FILES AND IS NOT REPRESENTATIVE OF ANY OTHER STACKUP DOCUMENTATION. REFER TO THE SCHEMATIC, ORIGINAL GERBER FILES, REPORTS, ETC. FOR FURTHER INFORMATION.
7. INSERT LOCKING END OF STANDOFFS INTO BOARD.
8. DO NOT INSTALL R5-8 AND R13-16.
9. SEE DETAIL "A" FOR CORRECT ORIENTATION OF D2-D6, D8-D12, D15, D16, D19 AND D20. CATHODE IS PLACED AT SILKSCREEN POINT.
10. THIS ASSEMBLY CONTAINS SENSITIVE CIRCUITS AND MUST BE FREE OF ANY SURFACE CONTAMINATION. CLEAN BOARD AFTER SOLDERING. HANDLE WITH LINT FREE COTTON OR DISPOSABLE PLASTIC GLOVES. THIS BOARD MUST BE TESTED PERIODICALLY PER ADVANCED INSTRUMENTS PROCEEDURE 6309_MTP.
11. REMOVE PIN 4 OF J2 AND PIN 3 OF J1 BEFORE ASSEMBLY.
12. ITEMS INSTALLED AFTER SOLDER AND/OR WASHING.
13. SOLDER ALL CONNECTOR RETAINING CLIPS ON J10.
14. INSTALL SHUNT AT JP4.

DETAIL "A"


SILKSCREEN
ANODE PAD
CATHODE PAD

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UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON;
2 PL DECIMALS +/- .010
3 PL DECIMALS +/- .005
ANGLES +
FRACTIONS +

THIS DOCUMENT CREATED USING ORCAD PCB V16.5

REFERENCE PROJECT FILE PCB605_5.BRD AND ASSOCIATED FILES

ADVANCED INSTRUMENTS, INC.
Two Technology Way
Norwood, MA 02062

TELEPHONE:(781)320-9000
FAX: (781)320-8181

DFT	N.IBANEZ	7/21/00	DWG, GENERIC PCB -3D3/4D3/MK2		
CHKD	D.SOLANDER	7/31/01	NEXT ASSY. 4D3605	SCALE 1:1	SIZE C
APPD	C.DANIELS	8/01/01	SHEET 1 OF 1	DWG. NO. PCB605_DWG	REV. 11

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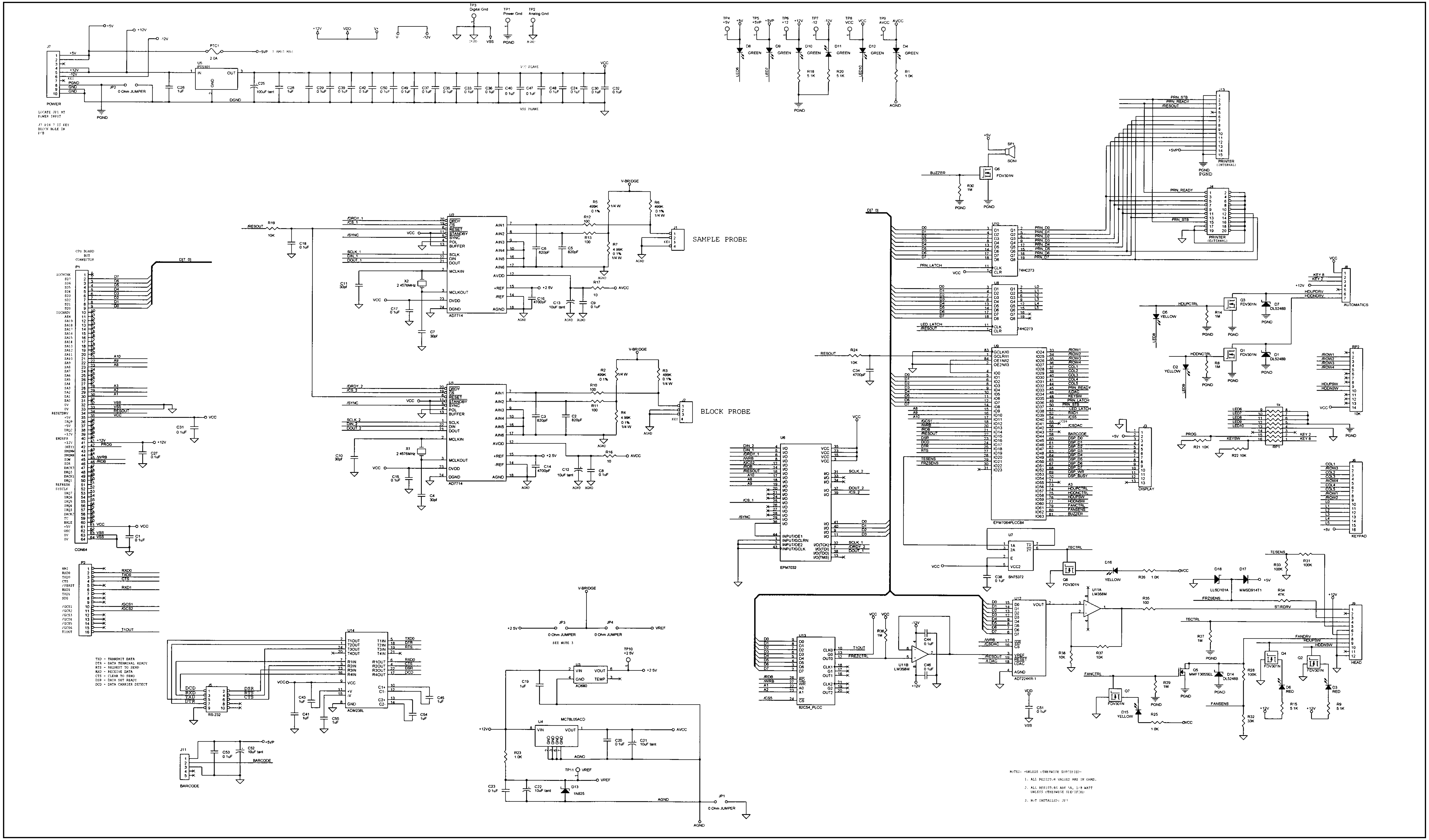
PCB605 Assembly Drawing Rev11



POWER
J7
PTC1
2.0A
U5
PT5101
LOCATE JP1 AT POWER INPUT
J7 PIN 7 IS KEY
BLOCK HOLE IN P/B
JP2
0 Ohm JUMPER
PGND
DGND
VCC PLANE
VSS PLANE
TP3 Digital Gnd
TP1 Power Gnd
TP2 Analog Gnd
TP4 +5V
TP5 +5VP
TP6 +12
TP7 -12
TP8 VCC
TP9 AVCC
D8 GREEN
D9 GREEN
D10 GREEN
D11 GREEN
D12 GREEN
D4 GREEN
R18 5.1K
R20 5.1K
R1 1.0K
AGND
PRINTER (INTERNAL)
J3
PRINTER (EXTERNAL)
J4
SP1 SONI
Q6 FDV301N
BUZZER
R30 1M
U10 74HC273
U8 74HC273
U9 EPM7064PLCC84
AUTOMATICS
Q3 FDV301N
Q1 FDV301N
D7 DL5248B
D1 DL5248B
Q5 YELLOW
D2 YELLOW
HDUPCTRL
HDDNCTRL
RP2
KEYPAD
J6
RP1
DISPLAY
U7 SN75372
TECTRL
D16 YELLOW
R26 1.0K
D18 LLSD101A
D17 MMSD914T1
TESENS
R33 100K
R31 100K
R34 47K
STIRDRV
FRZSENS
U11A LM358M
R35 100
R37 10K
R38 10K
U12 AD7224KR-1
HEAD
J9
R27 1M
Q5 MMFT3055EL
D14 DL5248B
R28 100K
R29 1M
R32 33K
Q4 FDV301N
Q2 FDV301N
D6 RED
D3 RED
R15 5.1K
R9 5.1K
Q7 FDV301N
D15 YELLOW
R25 1.0K
FANCTRL
FANDRV
FANSENS
U13 82C54_PLCC
U11B LM358M
R36 1M
C44 0.1uF
C46 0.1uF
C51 0.1uF
U6 EPM7032
R24 10K
C34 4700pF
RESOUT
D[7..0]
U2 AD7714
U1 AD7714
X2 2.4576MHz
X1 2.4576MHz
V-BRIDGE
R5 499K 0.1% 1/4 W
R6 499K 0.1% 1/4 W
R7 4.99K 0.1% 1/4 W
R12 100
R13 100
R17 10
SAMPLE PROBE
J1
R2 499K 0.1% 1/4 W
R3 499K 0.1% 1/4 W
R4 4.99K 0.1% 1/4 W
R10 100
R11 100
R16 10
BLOCK PROBE
J2
R19 10K
/RESOUT
CPU BOARD BUS CONNECTOR
P1
CON64
P2
U14 ADM238L
J5 RS-232
TXD - TRANSMIT DATA
DTR - DATA TERMINAL READY
RTS - REQUEST TO SEND
RXD - RECEIVE DATA
CTS - CLEAR TO SEND
DSR - DATA SET READY
DCD - DATA CARRIER DETECT
J11
BARCODE
C53 0.1uF
C52 10uF tant
+5VP
JP3 0 Ohm JUMPER
JP4 0 Ohm JUMPER
SEE NOTE 3
TP10 +2.5V
U3 AD680
C19 1uF
U4 MC78L05ACD
R23 1.0K
TP11 VREF
C23 0.1uF
C22 10uF tant
D13 1N825
C20 0.1uF
C21 10uF tant
JP1 0 Ohm JUMPER
AVCC
VREF
NOTES: -UNLESS OTHERWISE SPECIFIED-
1. ALL RESISTOR VALUES ARE IN OHMS.
2. ALL RESISTORS ARE 5%, 1/8 WATT UNLESS OTHERWISE SPECIFIED
3. NOT INSTALLED: JP3

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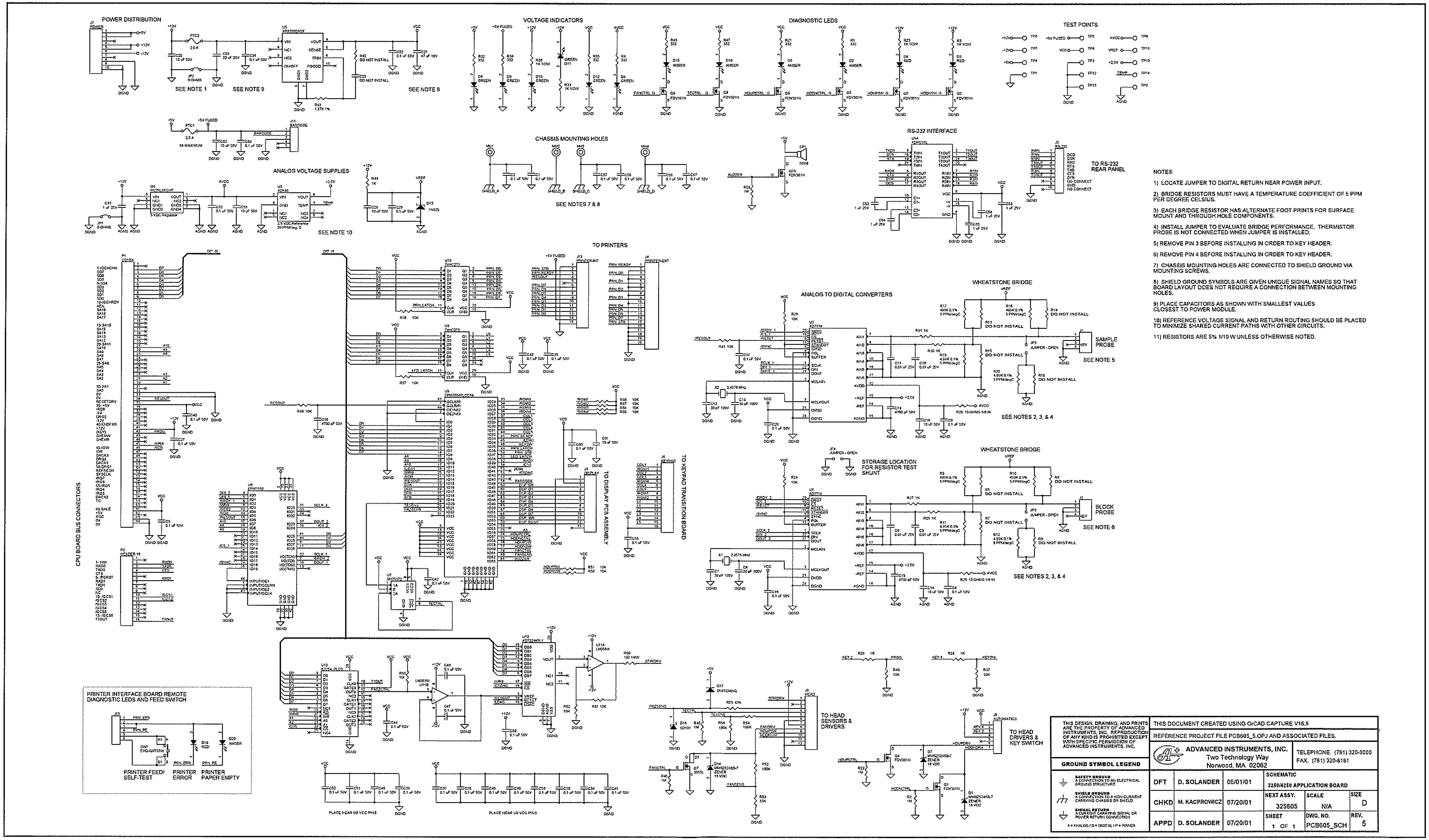
PCB605 Application Board Schematic Rev2


POWER DISTRIBUTION
SEE NOTE 1
SEE NOTE 9
VOLTAGE INDICATORS
DIAGNOSTIC LEDS
TEST POINTS
ANALOG VOLTAGE SUPPLIES
SEE NOTE 10
CHASSIS MOUNTING HOLES
SEE NOTES 7 & 8
RS-232 INTERFACE
TO RS-232 REAR PANEL
TO PRINTERS
ANALOG TO DIGITAL CONVERTERS
WHEATSTONE BRIDGE
SAMPLE PROBE
SEE NOTE 5
SEE NOTES 2, 3, & 4
STORAGE LOCATION FOR RESISTOR TEST SHUNT
BLOCK PROBE
SEE NOTE 6
TO DISPLAY PCB ASSEMBLY
TO KEYPAD TRANSITION BOARD
CPU BOARD BUS CONNECTORS
PRINTER INTERFACE BOARD REMOTE DIAGNOSTIC LEDS AND FEED SWITCH
PRINTER FEED/ SELF-TEST
PRINTER ERROR
PRINTER PAPER EMPTY
PLACE NEAR U8 VCC PINS
PLACE NEAR U9 VCC PINS
TO HEAD SENSORS & DRIVERS
TO HEAD DRIVERS & KEY SWITCH

NOTES:

1) LOCATE JUMPER TO DIGITAL RETURN NEAR POWER INPUT.

2) BRIDGE RESISTORS MUST HAVE A TEMPERATURE COEFFICIENT OF 5 PPM PER DEGREE CELSIUS.

3) EACH BRIDGE RESISTOR HAS ALTERNATE FOOT PRINTS FOR SURFACE MOUNT AND THROUGH HOLE COMPONENTS.

4) INSTALL JUMPER TO EVALUATE BRIDGE PERFORMANCE. THERMISTOR PROBE IS NOT CONNECTED WHEN JUMPER IS INSTALLED.

5) REMOVE PIN 3 BEFORE INSTALLING IN ORDER TO KEY HEADER.

6) REMOVE PIN 4 BEFORE INSTALLING IN ORDER TO KEY HEADER.

7) CHASSIS MOUNTING HOLES ARE CONNECTED TO SHIELD GROUND VIA MOUNTING SCREWS.

8) SHIELD GROUND SYMBOLS ARE GIVEN UNIQUE SIGNAL NAMES SO THAT BOARD LAYOUT DOES NOT REQUIRE A CONNECTION BETWEEN MOUNTING HOLES.

9) PLACE CAPACITORS AS SHOWN WITH SMALLEST VALUES CLOSEST TO POWER MODULE.

10) REFERENCE VOLTAGE SIGNAL AND RETURN ROUTING SHOULD BE PLACED TO MINIMIZE SHARED CURRENT PATHS WITH OTHER CIRCUITS.

11) RESISTORS ARE 5% 1/10 W UNLESS OTHERWISE NOTED.

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REFERENCE PROJECT FILE PCB605_5.OPJ AND ASSOCIATED FILES.

GROUND SYMBOL LEGEND

SAFETY GROUND A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE

SHIELD GROUND A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD

SIGNAL RETURN A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

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DFT	D. SOLANDER	06/01/01	SCHEMATIC 3250/4250 APPLICATION BOARD		
CHKD	M. KACPROWICZ	07/20/01	NEXT ASSY. 325605	SCALE N/A	SIZE D
APPD	D. SOLANDER	07/20/01	SHEET 1 OF 1	DWG. NO. PCB605_SCH	REV. 5

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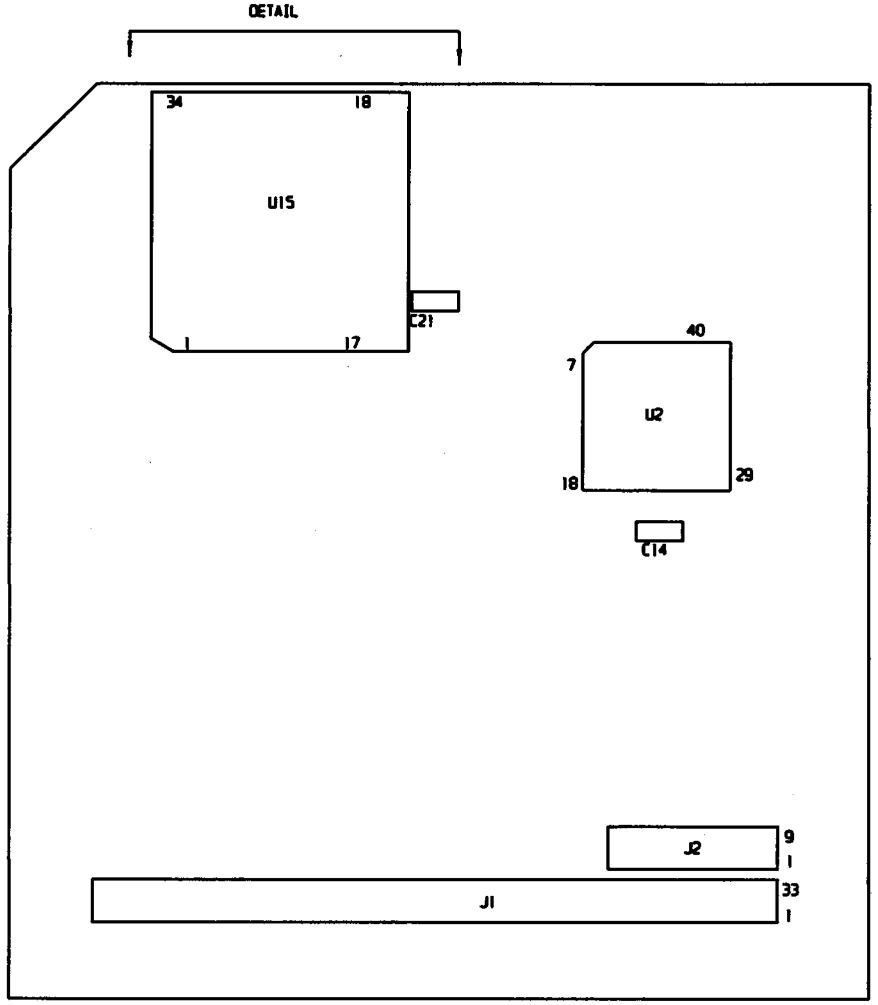
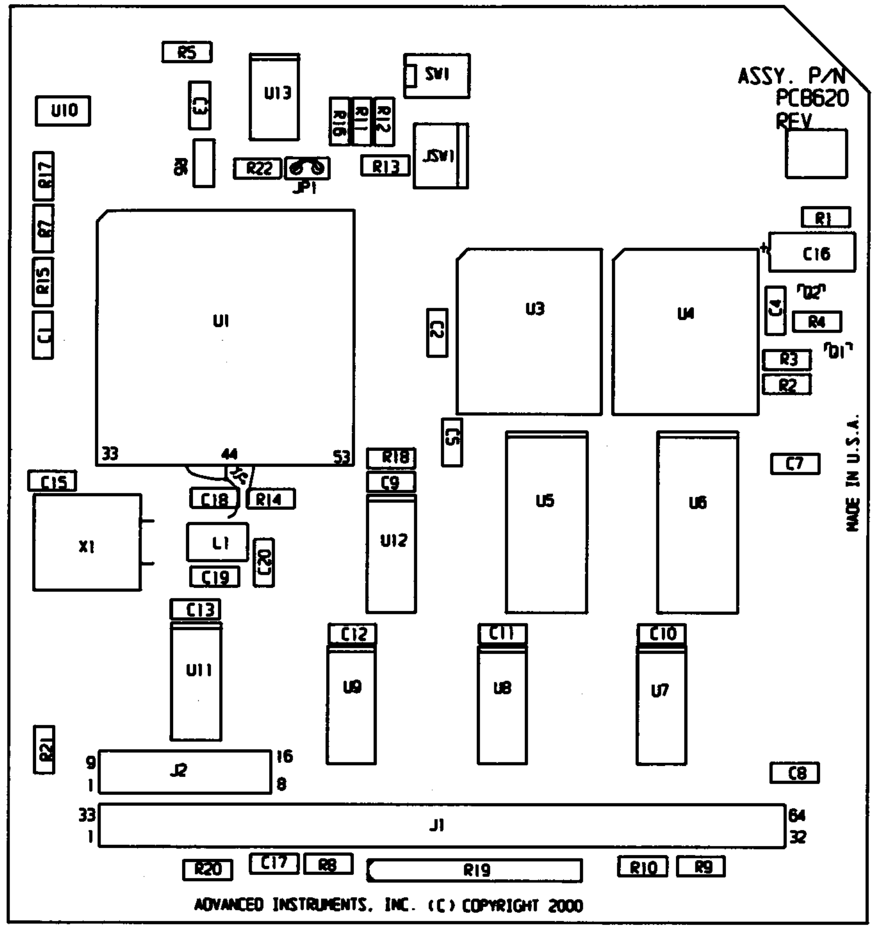
PCB605 Schematic Rev5


DETAIL
34
18
U15
C21
1
17
40
7
U2
18
29
C14
J2
9
1
J1
33
1

BOTTOM


R5
U10
C3
U13
SW1
R16
R11
R12
R6
R22
JP1
R13
JSW1
ASSY. P/N
PCB620
REV
R17
R7
R15
C1
U1
R1
C16
U3
U4
C2
C4
Q2
R4
D1
R3
R2
33
44
53
C5
R18
C9
C15
Y1
C18
R14
X1
L1
C20
C19
U12
U5
U6
C7
MADE IN U.S.A.
C13
U11
C12
U9
C11
U8
C10
U7
R21
9
1
J2
16
8
C8
33
1
J1
64
32
R20
C17
R8
R19
R10
R9
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TOP

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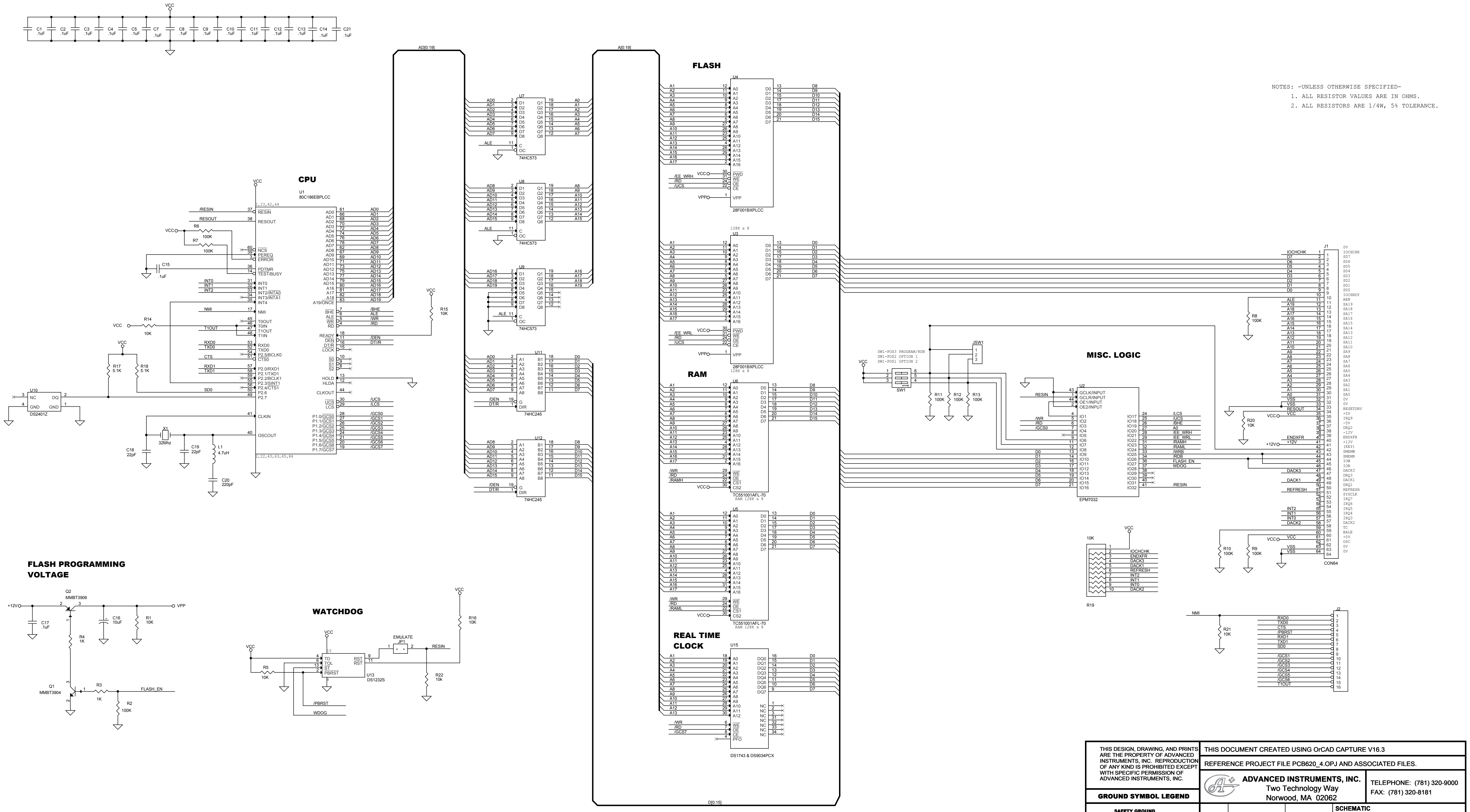
PCB620 Assembly Drawing


VCC
CPU
U1
80C186EBPLCC
FLASH PROGRAMMING
VOLTAGE
WATCHDOG
U13
DS1232S
EMULATE
JP1
AD[0:19]
A[0:19]
D[0:15]
74HC573
74HC245
FLASH
28F008XPLCC
RAM
TC551001AFL-70
REAL TIME
CLOCK
DS1743 & DS9034PCX
MISC. LOGIC
EPM7032
SW1
R19
J1
CON64
J2
U10
DS2401Z
Q1
MMBT3904
Q2
MMBT3906
X1
32Mhz

NOTES: -UNLESS OTHERWISE SPECIFIED-

1. ALL RESISTOR VALUES ARE IN OHMS.
2. ALL RESISTORS ARE 1/4W, 5% TOLERANCE.

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REFERENCE PROJECT FILE PCB620_4.OPJ AND ASSOCIATED FILES.

GROUND SYMBOL LEGEND

- ⏚ **SAFETY GROUND** A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE
- **SHIELD GROUND** A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD
- ▽ **SIGNAL RETURN** A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

ADVANCED INSTRUMENTS, INC.
Two Technology Way
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TELEPHONE: (781) 320-9000
FAX: (781) 320-8181

DFT	J. DUCHESNEY	12/8/95	SCHEMATIC SCHEMATIC, 80C186 CPU BOARD		
CHKD	J DUCHESNEY	8/26/96	NEXT ASSY. N/A	SCALE N/A	SIZE D
APPD	B. PERRY	8/26/96	SHEET 1 OF 1	DWG. NO. PCB620	REV. 4

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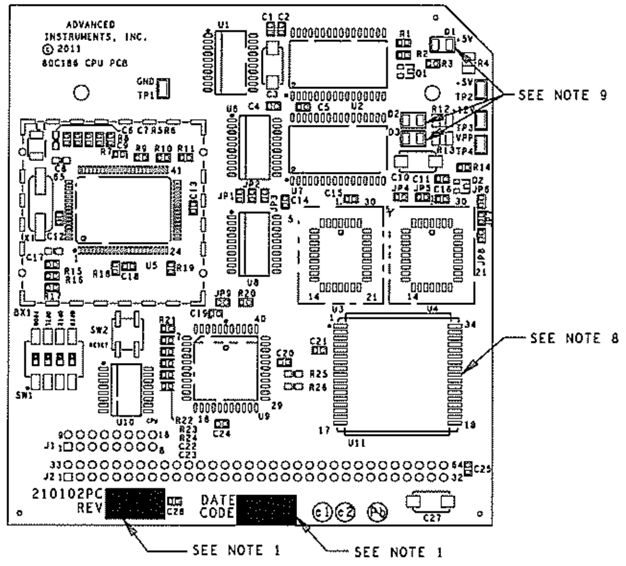
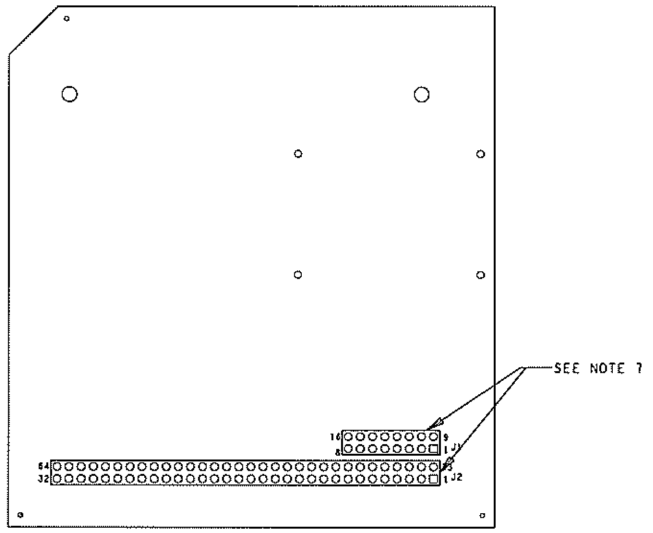
PCB620 Processor Board Schematic Rev4

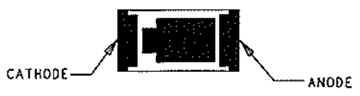


ASSEMBLY TOP
(VIEWED FROM THE COMPONENT SIDE)

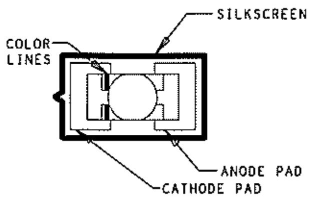


ASSEMBLY BOTTOM
(MIRRORED-VIEWED FROM THE SOLDER SIDE)

LED DETAIL
(VIEWED FROM BOTTOM)



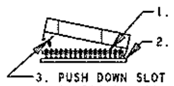
LED FOOT PRINT DETAIL



NOTES:
1. ALL MARKINGS TO BE IN BLACK INDELIBLE INK OR PERMANENT ADHESIVE LABEL. MARK DATE CODE, SUPPLIER IDENTIFICATION AND BOM REVISION LEVEL.
2. PCB ASSEMBLY TO BE BUILT AND INSPECTED TO IPC-A-610 CLASS 2.
3. BOARD TO BE ASSEMBLED IN COMPLIANCE WITH EU-RoHS DIRECTIVE.
4. SOLDER - USE RoHS COMPLIANT SOLDER SPECIFIED ON ASSEMBLY BOM.
5. SHIP ASSEMBLED BOARDS IN ANTI-STATIC PACKAGING.
6. THIS DOCUMENT PROVIDES A REFERENCE MECHANICAL VIEW ONLY. FOR DIMENSIONS REFER TO BOARD FABRICATION DRAWING. THIS DRAWING IS BASED ON THE ASSEMBLY TOP AND OR BOTTOM GERBER FILES AND IS NOT REPRESENTATIVE OF ANY OTHER STACKUP DOCUMENTATION. REFER TO THE SCHEMATIC, ORIGINAL GERBER FILES, REPORTS, ETC. FOR FURTHER INFORMATION.
7. J1 AND J2 ARE MOUNTED ON BOTTOM SIDE.
8. ATTACH POWERCAP ITEM 28 AFTER SOLDERING AND WASHING. SEE POWERCAP DETAIL FOR ATTACHMENT/REMOVAL INSTRUCTIONS.
9. SEE LED FOOT PRINT DETAIL.

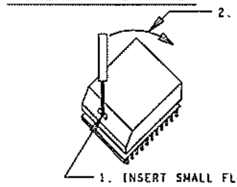
POWERCAP DETAIL

POWERCAP ATTACHMENT



1. ALIGN POWERCAP CONTACT SPRINGS WITH MODULE BASE CONTACT LANDS.
2. HOOK POWERCAP FLANGE UNDER MODULE BASE BOARD. FIT ALIGNMENT NOTCHES IN MODULE BASE BOARD.
3. PUSH DOWN SLOT SIDE OF POWERCAP UNTIL SNAPS ONTO MODULE BASE.

POWERCAP REMOVAL



2. PULL BACK SCREWDRIVER HANDLE SLOWLY UNTIL SLOT SIDE OF POWERCAP RELEASES FROM MODULE BASE.
1. INSERT SMALL FLATHEAD SCREWDRIVER VERTICALLY INTO POWERCAP SLOT.

NOTE:
ATTACH POWERCAP AFTER SOLDERING AND AFTER WASHING.

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2 PL DECIMALS +/- .010
3 PL DECIMALS +/- .005
ANGLES +
FRACTIONS +

THIS DOCUMENT CREATED USING ORCAD PCB V16.3
REFERENCE PROJECT FILE 210102FB_1.BRD AND ASSOCIATED FILES

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Two Technology Way
Norwood, MA 02062
TELEPHONE:(781)320-9000
FAX: (781)320-8181

DFT	JIM BRINKMAN	01/25/2011	ASSEMBLY, 80C186 CPU PCB - DOUBLE CONN.		
CHKD	D.SOLANDER	7/14/11	NEXT ASSY. 210102PC	SCALE N/A	SIZE C
APPD	M.KACPROWICZ	7/14/11	SHEET 1 OF 1	DWG. NO. 210102DG	REV. 1

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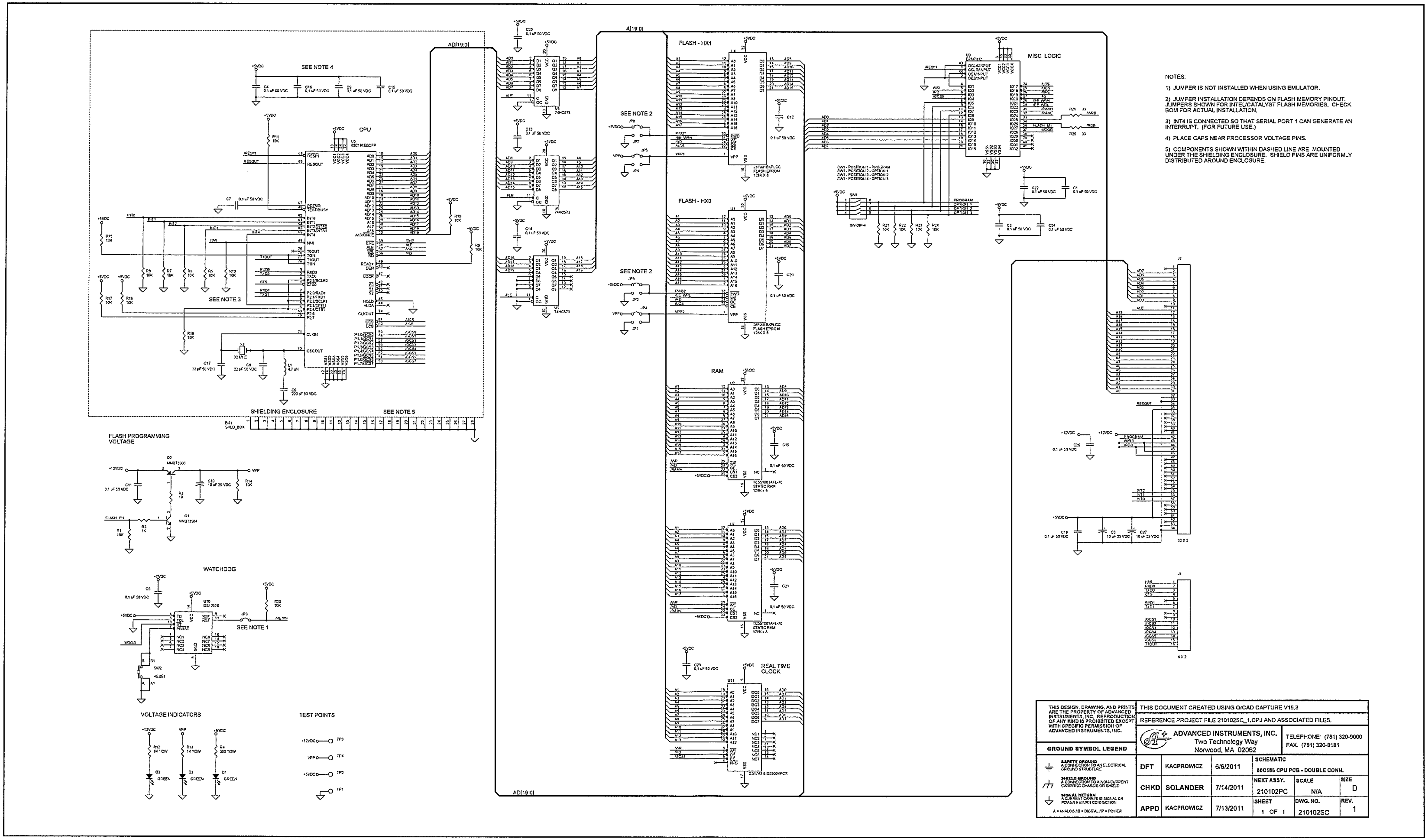
210102 Assembly Drawing Rev1


CPU
80C186EC
SEE NOTE 4
SEE NOTE 3
SHIELDING ENCLOSURE
SEE NOTE 5
SHLD_BOX
FLASH PROGRAMMING VOLTAGE
MMBT3906
MMBT3904
WATCHDOG
DS1232S
SEE NOTE 1
RESET
VOLTAGE INDICATORS
GREEN
TEST POINTS
74HC573
AD[19:0]
A[19:0]
SEE NOTE 2
FLASH - HX1
FLASH - HX0
28F010 PLCC FLASH EPROM 128K X 8
RAM
TC551001AFL-70 STATIC RAM 128K x 8
REAL TIME CLOCK
DS1743 & DS5034PCK
MISC. LOGIC
EPM7032
SW1 - POSITION 1 - PROGRAM
SW1 - POSITION 2 - OPTION 1
SW1 - POSITION 3 - OPTION 2
SW1 - POSITION 4 - OPTION 3
SW DIP-4
J2
32 X 2
J1
6 X 2

NOTES:

1) JUMPER IS NOT INSTALLED WHEN USING EMULATOR.

2) JUMPER INSTALLATION DEPENDS ON FLASH MEMORY PINOUT. JUMPERS SHOWN FOR INTEL/CATALYST FLASH MEMORIES. CHECK BOM FOR ACTUAL INSTALLATION.

3) INT4 IS CONNECTED SO THAT SERIAL PORT 1 CAN GENERATE AN INTERRUPT. (FOR FUTURE USE.)

4) PLACE CAPS NEAR PROCESSOR VOLTAGE PINS.

5) COMPONENTS SHOWN WITHIN DASHED LINE ARE MOUNTED UNDER THE SHIELDING ENCLOSURE. SHIELD PINS ARE UNIFORMLY DISTRIBUTED AROUND ENCLOSURE.

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REFERENCE PROJECT FILE 210102SC_1.OPJ AND ASSOCIATED FILES.

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FAX. (781) 320-8181

GROUND SYMBOL LEGEND

- **SAFETY GROUND** A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE
- **SHIELD GROUND** A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD
- **SIGNAL RETURN** A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

DFT	KACPROWICZ	6/6/2011	SCHEMATIC 80C186 CPU PCB - DOUBLE CONN.		
CHKD	SOLANDER	7/14/2011	NEXT ASSY. 210102PC	SCALE N/A	SIZE D
APPD	KACPROWICZ	7/13/2011	SHEET 1 OF 1	DWG. NO. 210102SC	REV. 1

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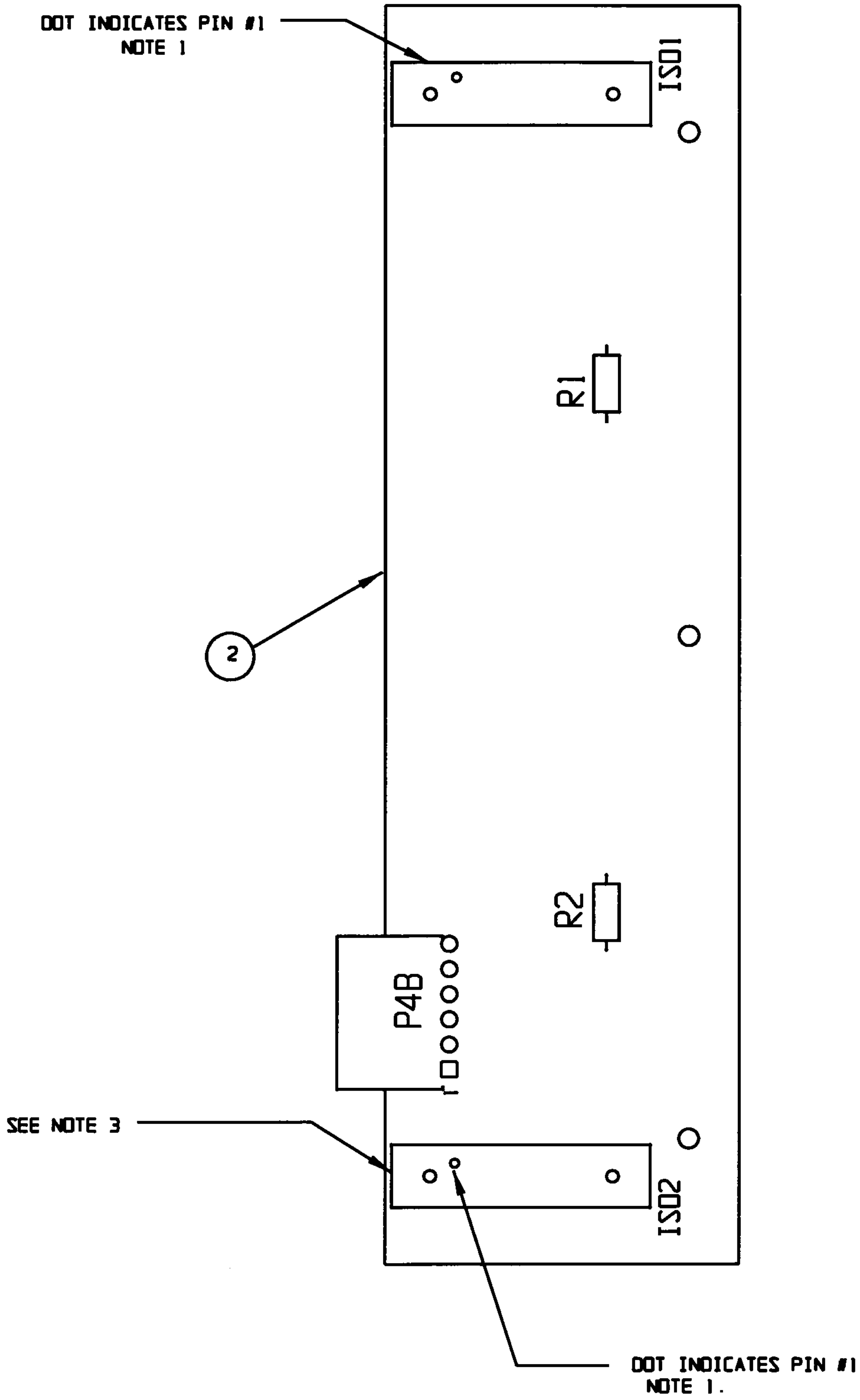
210102 Schematic Rev1


DOT INDICATES PIN #1
NOTE 1
ISO1
R1
2
R2
P4B
1
SEE NOTE 3
ISO2
DOT INDICATES PIN #1
NOTE 1.

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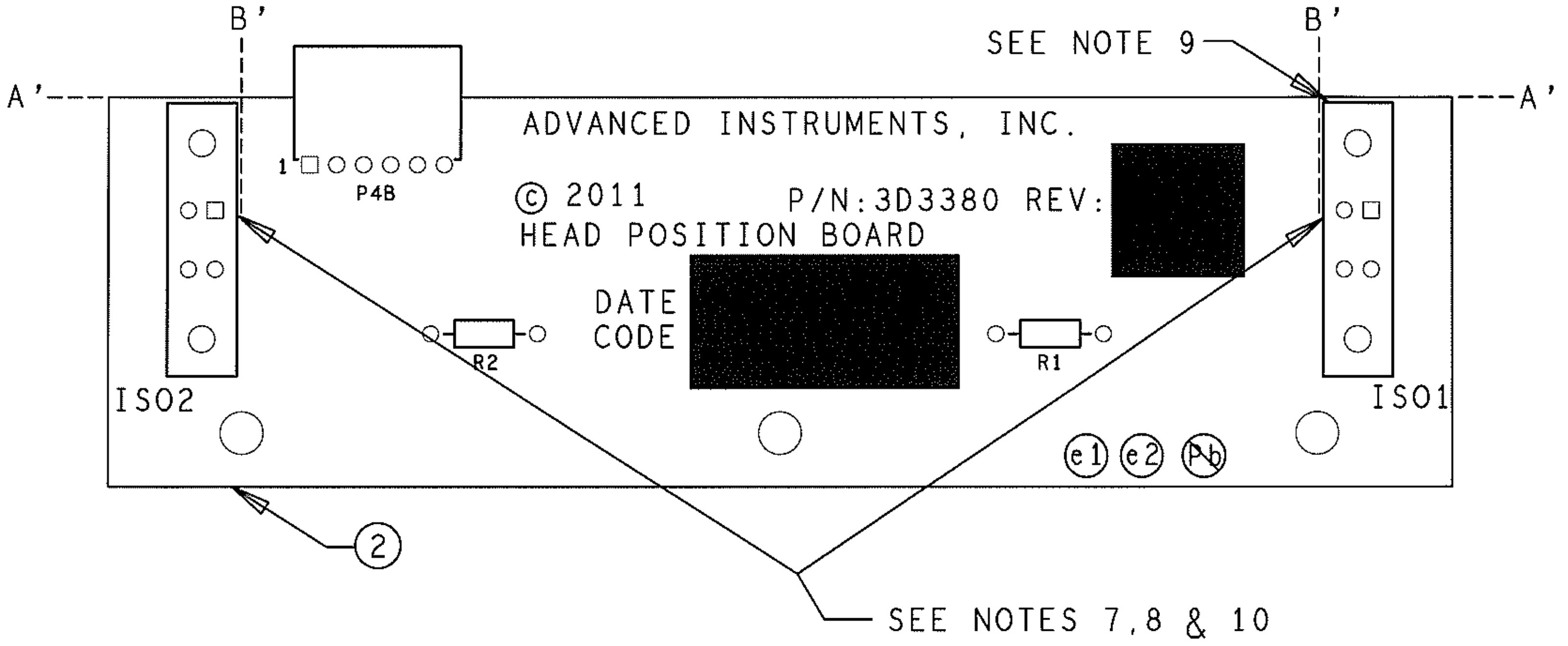
3D3380 Assembly Drawing Rev5



ASSEMBLY TOP

(VIEWED FROM THE COMPONENT SIDE)

SCALE 1.5:1

NOTES:

1. ALL MARKINGS TO BE IN BLACK INDELIBLE INK OR PERMANENT ADHESIVE LABEL. MARK DATE CODE, SUPPLIER IDENTIFICATION AND BOM REVISION LEVEL.
2. PCB ASSEMBLY TO BE BUILT AND INSPECTED TO IPC-A-610 CLASS 2.
3. BOARD TO BE ASSEMBLED IN COMPLIANCE WITH EU-RoHS DIRECTIVE.
4. SOLDER - USE RoHS COMPLIANT SOLDER SPECIFIED ON ASSEMBLY BOM.
5. SHIP ASSEMBLED BOARDS IN ANTI-STATIC PACKAGING.
6. THIS DOCUMENT PROVIDES A REFERENCE MECHANICAL VIEW ONLY. FOR DIMENSIONS REFER TO BOARD FABRICATION DRAWING. THIS DRAWING IS BASED ON THE ASSEMBLY TOP AND OR BOTTOM GERBER FILES AND IS NOT REPRESENTATIVE OF ANY OTHER STACKUP DOCUMENTATION. REFER TO THE SCHEMATIC, ORIGINAL GERBER FILES, REPORTS, ETC. FOR FURTHER INFORMATION.
7. BOARD EDGE A' AND SENSOR EDGE B' MUST BE PERPENDICULAR.
8. EMITTER SHOULD BE PLACED AT THE TOP SIDE. EMITTER MAY BE DESIGNATED BY THE LETTER "E", A DOT ON TOP OR A LIGHT COLORED CAP.
9. USE TWO SCREWS (#H42303) PER SENSOR (ISO1 OR ISO2) TO SECURE TO PCB PRIOR TO SOLDER. REMOVE SCREWS AFTER HAND SOLDER.
10. ISO1 & ISO2 - LEAVE LEADS STRAIGHT. DO NOT BEND ON SOLDER SIDE. HAND SOLDER LEADS THEN TRIM FLUSH WITH BOARD. HAND SOLDER REMAINDER OF BOARD AND CLEAN. DO NOT WAVE SOLDER THIS ASSEMBLY.

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3 PL DECIMALS +/- .005
ANGLES +
FRACTIONS +

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REFERENCE PROJECT FILE 3D3380FB_9.BRD AND ASSOCIATED FILES

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FAX: (781)320-8181

DFT	G.BEERS	07/08/92	HEAD POSITION PCB ASSEMBLY		
CHKD	D.SOLANDER	7.08.92	NEXT ASSY. N/A	SCALE 1.5	SIZE B
APPD	D.SOLANDER	7.08.92	SHEET 1 OF 1	DWG.NO. 3D3380_DWG	REV. 9

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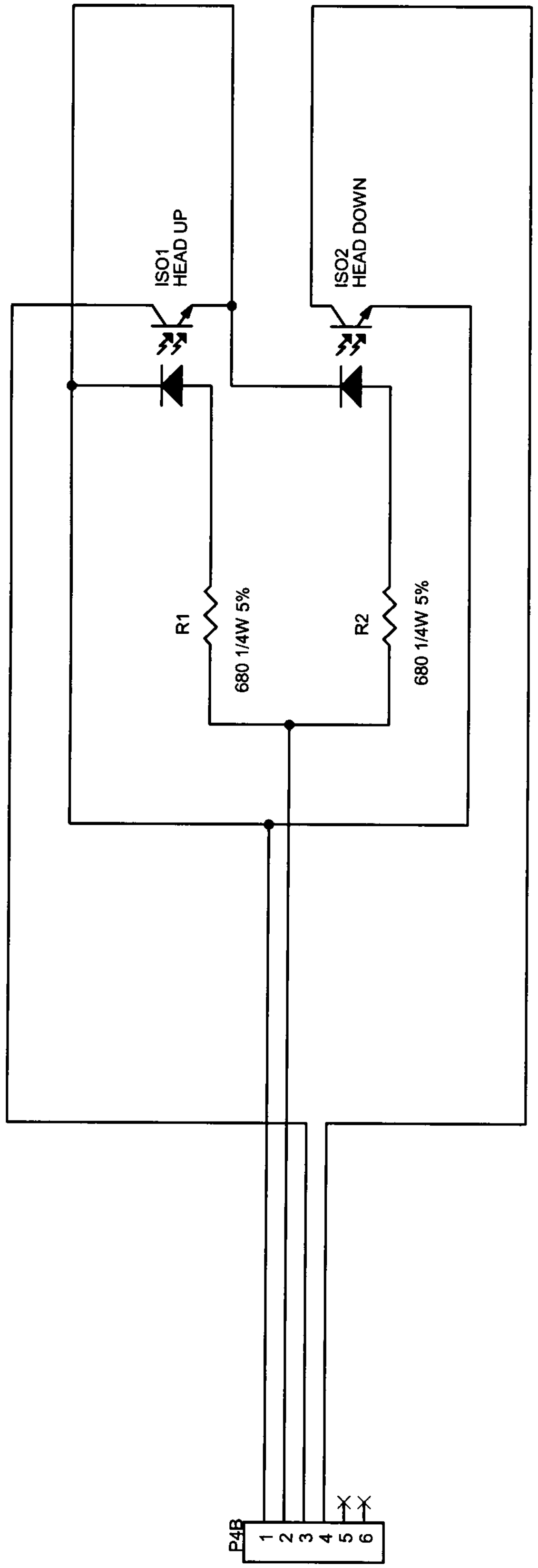
ISO1
HEAD UP
ISO2
HEAD DOWN
R1
680 1/4W 5%
R2
680 1/4W 5%
P4B
1
2
3
4
5
6

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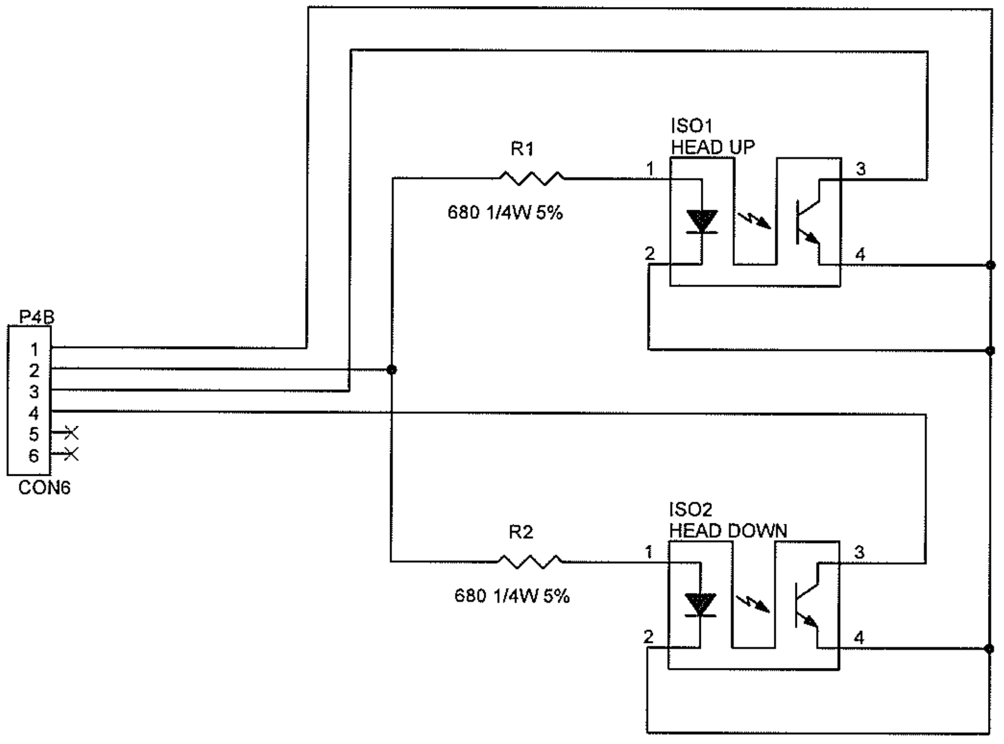
3D3380 Schematic Rev4



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GROUND SYMBOL LEGEND

SAFETY GROUND
A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE

SHIELD GROUND
A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD

SIGNAL RETURN
A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

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Norwood, MA 02062

TELEPHONE: (781) 320-9000
FAX: (781) 320-8181

DFT	**D. SOLANDER**	3/16/92	**SCHEMATIC** **SCHEMATIC, HEAD POSITION SENSOR BD.**
CHKD	**R. HILL**	8/24/93	**NEXT ASSY.** 3S0400 / **SCALE** N/A / **SIZE** B
APPD	**R. HILL**	8/24/93	**SHEET** 1 OF 1 / **DWG. NO.** 3D3380_SCH / **REV.** 5

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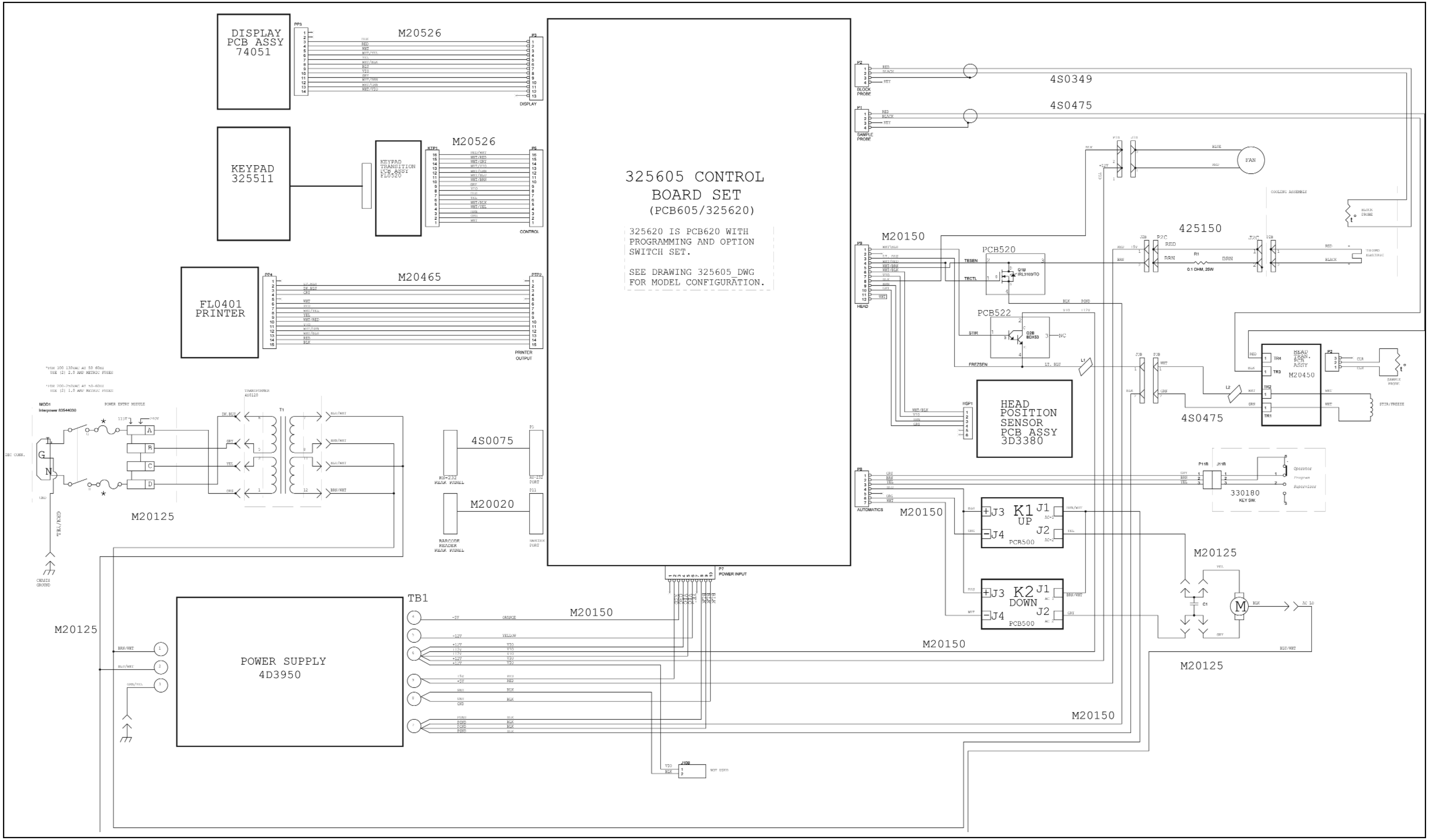
3D3380 Schematic Rev5


DISPLAY PCB ASSY 74051
M20526
DISPLAY
KEYPAD 325511
KEYPAD TRANSITION PCB ASSY FL0520
M20526
CONTROL
FL0401 PRINTER
M20465
PRINTER OUTPUT
325605 CONTROL BOARD SET
(PCB605/325620)
325620 IS PCB620 WITH PROGRAMMING AND OPTION SWITCH SET.
SEE DRAWING 325605_DWG FOR MODEL CONFIGURATION.
BLOCK PROBE
4S0349
SAMPLE PROBE
4S0475
FAN
COOLING ASSEMBLY
BLOCK PROBE
425150
M20150
PCB520
TESEN
TECTL
Q1B IRL3103/TO
R1 0.1 OHM, 25W
THERMO ELECTRIC
PCB522
STIR
Q2B BDX53
NC
FREZSEN
L1
HEAD
HEAD TRAN. PCB ASSY M20450
SAMPLE PROBE
STIR/FREEZE
L2
4S0475
HEAD POSITION SENSOR PCB ASSY 3D3380
AUTOMATICS
M20150
K1 UP PCB500
K2 DOWN PCB500
J1
J2
J3
J4
330180 KEY SW.
Operator
Program
Supervisor
M20125
C1
M
AC 10
M20150
M20125
M20150
MOD1 Interpower 83544030
POWER ENTRY MODULE
IEC CONN.
CHASSIS GROUND
GRN/YEL
115V
240V
A
B
C
D
TRANSFORMER 4D5120
T1
M20125
4S0075
RS-232 REAR PANEL
RS-232 PORT
M20020
BARCODE READER REAR PANEL
BARCODE PORT
P7 POWER INPUT
TB1
M20125
POWER SUPPLY 4D3950
M20150
-5V ORANGE
-12V YELLOW
+12V VIO
+5V RED
GND BLK
PGND BLK
J10B
NOT USED

325000 Interconnection Schematic Rev4
for Serial Suffix A & B

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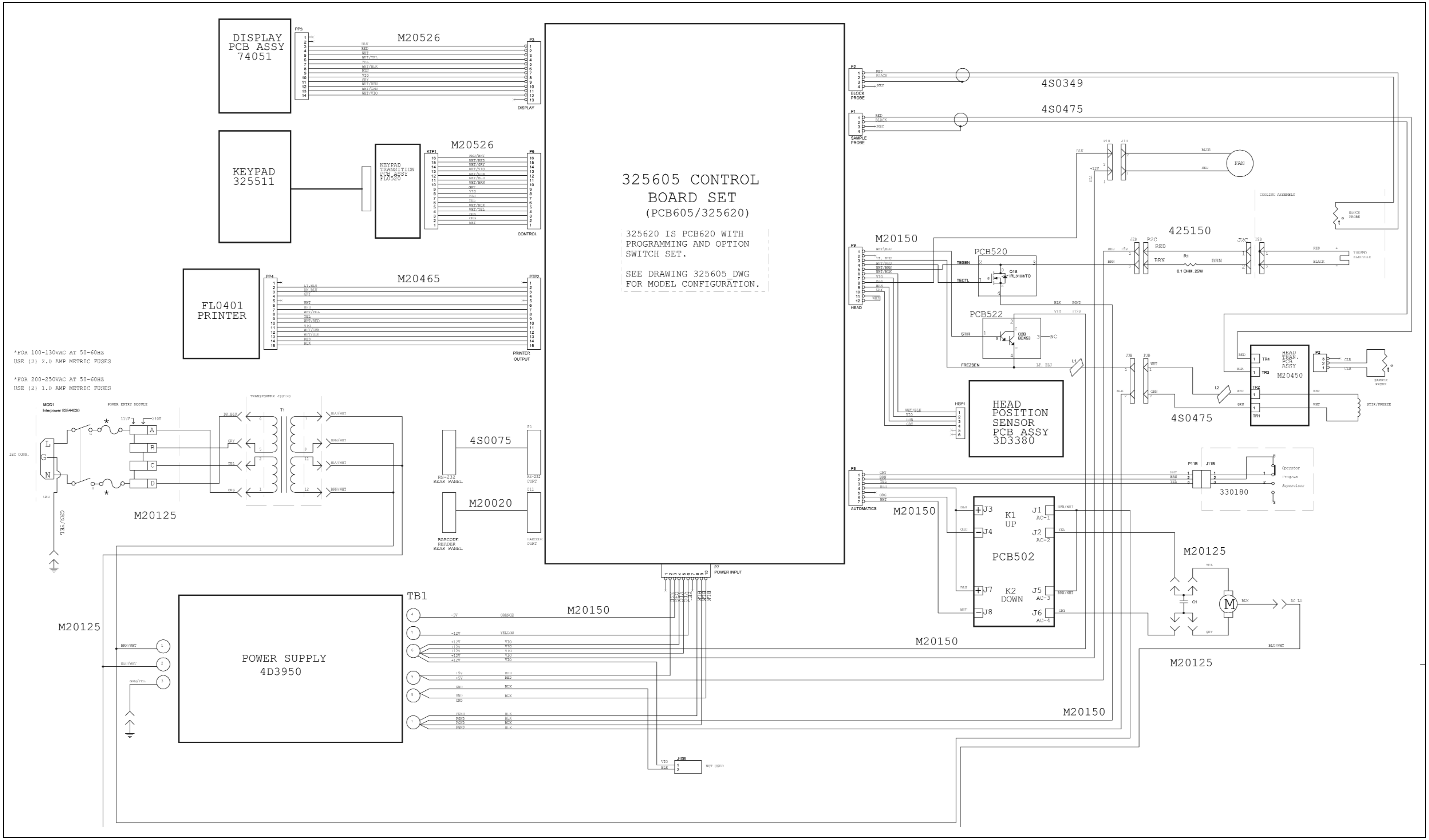
DISPLAY PCB ASSY 74051
M20526
DISPLAY
KEYPAD 325511
KEYPAD TRANSITION PCB ASSY FL0520
M20526
CONTROL
FL0401 PRINTER
M20465
PRINTER OUTPUT
*FOR 100-130VAC AT 50-60HZ USE (2) 2.0 AMP METRIC FUSES
*FOR 200-250VAC AT 50-60HZ USE (2) 1.0 AMP METRIC FUSES
MOD1
POWER ENTRY MODULE
TRANSFORMER
T1
L
G
N
IEC CONN.
A
B
C
D
M20125
GRN/YEL
4S0075
RS-232 REAR PANEL
RS-232 PORT
M20020
BARCODE READER REAR PANEL
325605 CONTROL BOARD SET
(PCB605/325620)
325620 IS PCB620 WITH PROGRAMMING AND OPTION SWITCH SET.
SEE DRAWING 325605_DWG FOR MODEL CONFIGURATION.
P7 POWER INPUT
TB1
M20150
POWER SUPPLY 4D3950
M20125
J10B
NOT USED
P2
BLOCK PROBE
4S0349
P1
SAMPLE PROBE
4S0475
FAN
COOLING ASSEMBLY
BLOCK PROBE
425150
P9
HEAD
M20150
PCB520
Q19 IRL3103/TO
TESEN
TECTL
R1
0.1 OHM, 25W
RED
BRN
THERMO ELECTRIC
PCB522
Q28 BDX53
STIR
NC
FREZSEN
L1
HEAD POSITION SENSOR PCB ASSY 3D3380
HSP1
HEAD TRAN. PCB ASSY M20450
TR4
TR3
TH2
TR1
L2
P2
SAMPLE PROBE
STIR/FREEZE
4S0475
P8
AUTOMATICS
P11B
J11B
Operator
Program
Supervisor
330180
M20150
J3
J4
K1 UP
J1 AC-1
J2 AC-2
PCB502
J7
J8
K2 DOWN
J5 AC-3
J6 AC-4
M20125
C1
M
AC LO
M20150
M20125
M20150

325000 Interconnection Schematic Rev5
for Serial Suffix C

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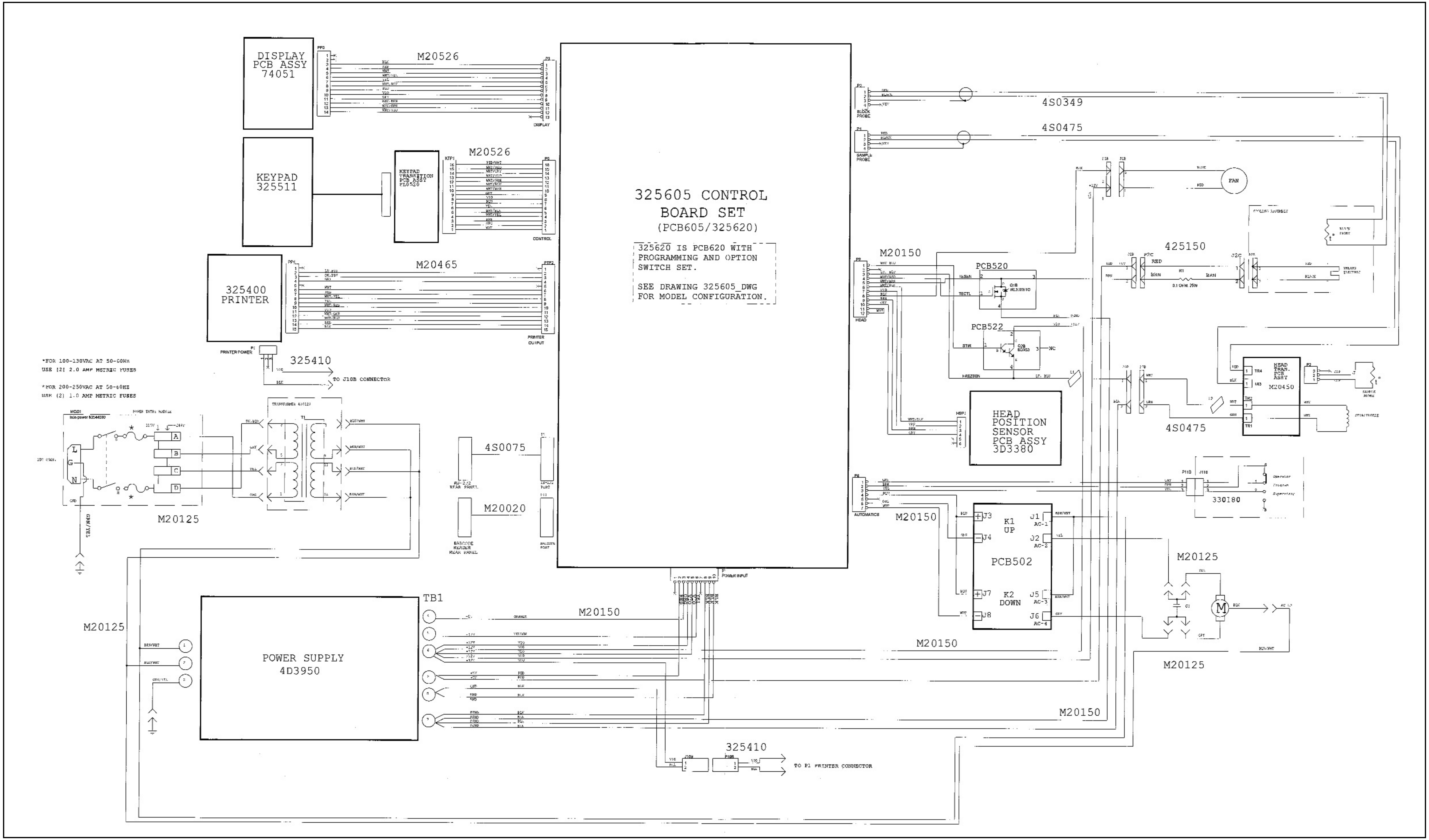
DISPLAY PCB ASSY 74051
M20526
DISPLAY
KEYPAD 325511
KEYPAD TRANSITION PCB ASSY PL0520
M20526
CONTROL
325400 PRINTER
M20465
PRINTER OUTPUT
PRINTER POWER
325410
TO J10B CONNECTOR
*FOR 100-130VAC AT 50-60Hz
USE (2) 2.0 AMP METRIC FUSES
*FOR 200-250VAC AT 50-60HZ
USE (2) 1.0 AMP METRIC FUSES
M20125
4S0075
M20020
BARCODE READER REAR PANEL
325605 CONTROL BOARD SET
(PCB605/325620)
325620 IS PCB620 WITH PROGRAMMING AND OPTION SWITCH SET.
SEE DRAWING 325605_DWG FOR MODEL CONFIGURATION.
POWER INPUT
TB1
M20150
POWER SUPPLY 4D3950
M20125
325410
TO P1 PRINTER CONNECTOR
BLOCK PROBE
SAMPLE PROBE
4S0349
4S0475
FAN
M20150
HEAD
PCB520
PCB522
NC
425150
0.1 OHM 25W
HEAD POSITION SENSOR PCB ASSY 3D3380
HEAD TRAN. PCB ASSY M20450
4S0475
AUTOMATICS
330180
M20150
K1 UP
K2 DOWN
PCB502
J1 AC-1
J2 AC-2
J3
J4
J5 AC-3
J6 AC-4
J7
J8
M20125
M
M20150
M20125
M20150

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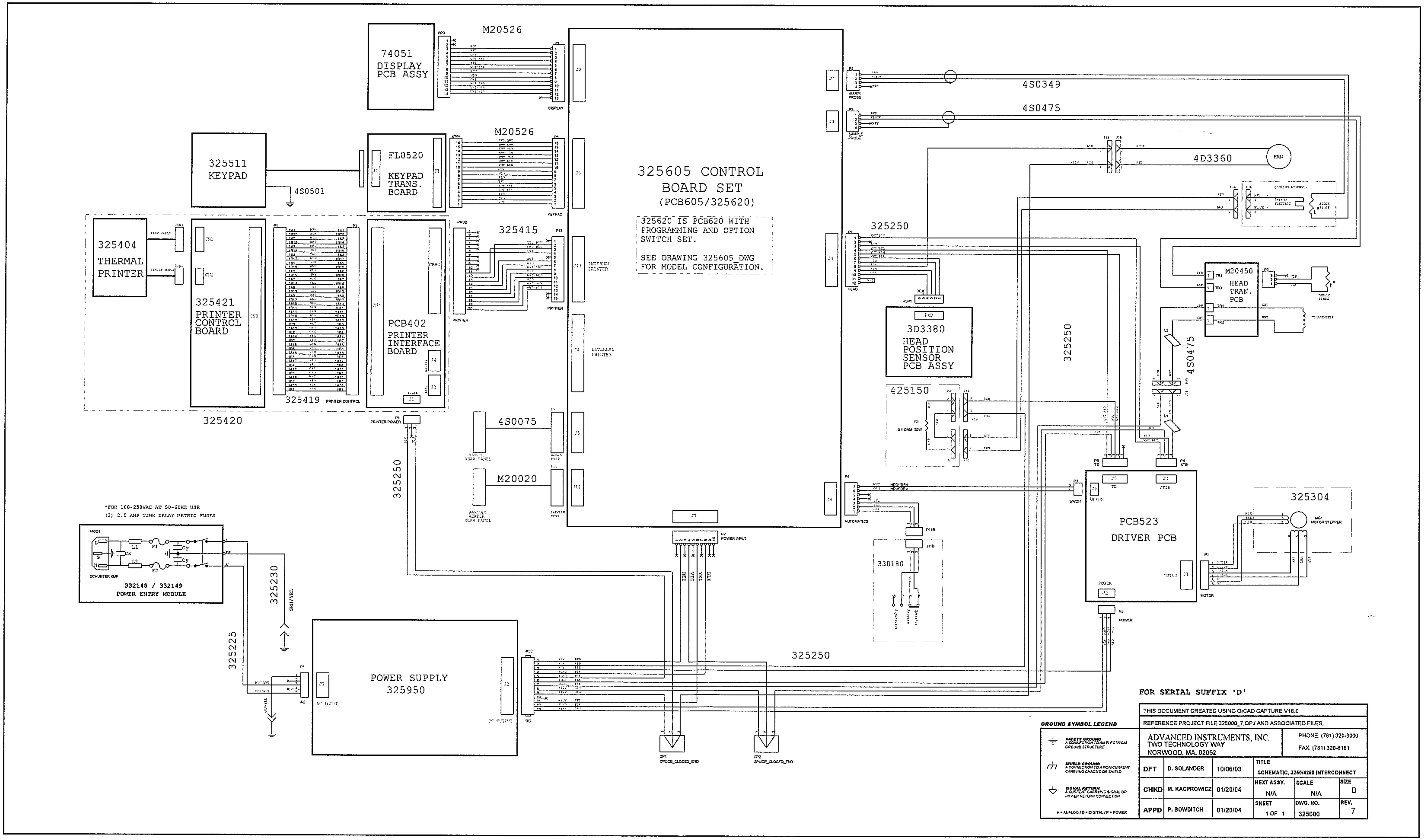
325000 Interconnection Schematic Rev6
for Serial Suffix C


74051
DISPLAY
PCB ASSY
M20526
DISPLAY
325511
KEYPAD
4S0501
FL0520
KEYPAD
TRANS.
BOARD
M20526
KEYPAD
325605 CONTROL
BOARD SET
(PCB605/325620)
325620 IS PCB620 WITH
PROGRAMMING AND OPTION
SWITCH SET.
SEE DRAWING 325605_DWG
FOR MODEL CONFIGURATION.
325404
THERMAL
PRINTER
325421
PRINTER
CONTROL
BOARD
325419
PRINTER CONTROL
PCB402
PRINTER
INTERFACE
BOARD
325420
325415
PRINTER
INTERNAL
PRINTER
EXTERNAL
PRINTER
PRINTER POWER
4S0075
REAR PANEL
M20020
BAR/CODE
READER
REAR PANEL
SERVICE
PORT
325250
BLOCK
PROBE
SAMPLE
PROBE
4S0349
4S0475
4D3360
FAN
COOLING ASSEMBLY
BLOCK
PROBE
325250
HEAD
HSP1
3D3380
HEAD
POSITION
SENSOR
PCB ASSY
425150
R1
0.1 OHM, 25W
M20450
HEAD
TRAN.
PCB
TR1
TR2
TR3
TR4
SAMPLE
PROBE
325250
4S0475
P5
TE
P4
STIR
AUTOMATICS
UP/DN
330180
P11B
J11B
PCB523
DRIVER PCB
TE
STIR
MOTOR
POWER
P2
POWER
325304
MG1
MOTOR STEPPER
P7
POWER INPUT
RED
VIO
YEL
BLK
325250
*FOR 100-250VAC AT 50-60HZ USE
(2) 2.0 AMP TIME DELAY METRIC FUSES
MOD1
L
G
N
L1
L2
F1
F2
Cx
Cy
Cy
SCHURTER KMF
332148 / 332149
POWER ENTRY MODULE
325230
GRN/YEL
325225
P1
AC
AC INPUT
POWER SUPPLY
325950
DC OUTPUT
PS2
DC
325250
SP1
SPLICE_CLOSED_END
SP2
SPLICE_CLOSED_END

FOR SERIAL SUFFIX 'D'

THIS DOCUMENT CREATED USING OrCAD CAPTURE V16.0

REFERENCE PROJECT FILE 325000_7.OPJ AND ASSOCIATED FILES.

GROUND SYMBOL LEGEND

⏚ **SAFETY GROUND** A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE

SHIELD GROUND A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD

SIGNAL RETURN A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION

A = ANALOG / D = DIGITAL / P = POWER

ADVANCED INSTRUMENTS, INC.
TWO TECHNOLOGY WAY
NORWOOD, MA. 02062

PHONE: (781) 320-9000
FAX: (781) 320-8181

DFT	D. SOLANDER	10/06/03	TITLE SCHEMATIC, 3250/4250 INTERCONNECT		
CHKD	M. KACPROWICZ	01/20/04	NEXT ASSY. N/A	SCALE N/A	SIZE D
APPD	P. BOWDITCH	01/20/04	SHEET 1 OF 1	DWG. NO. 325000	REV. 7

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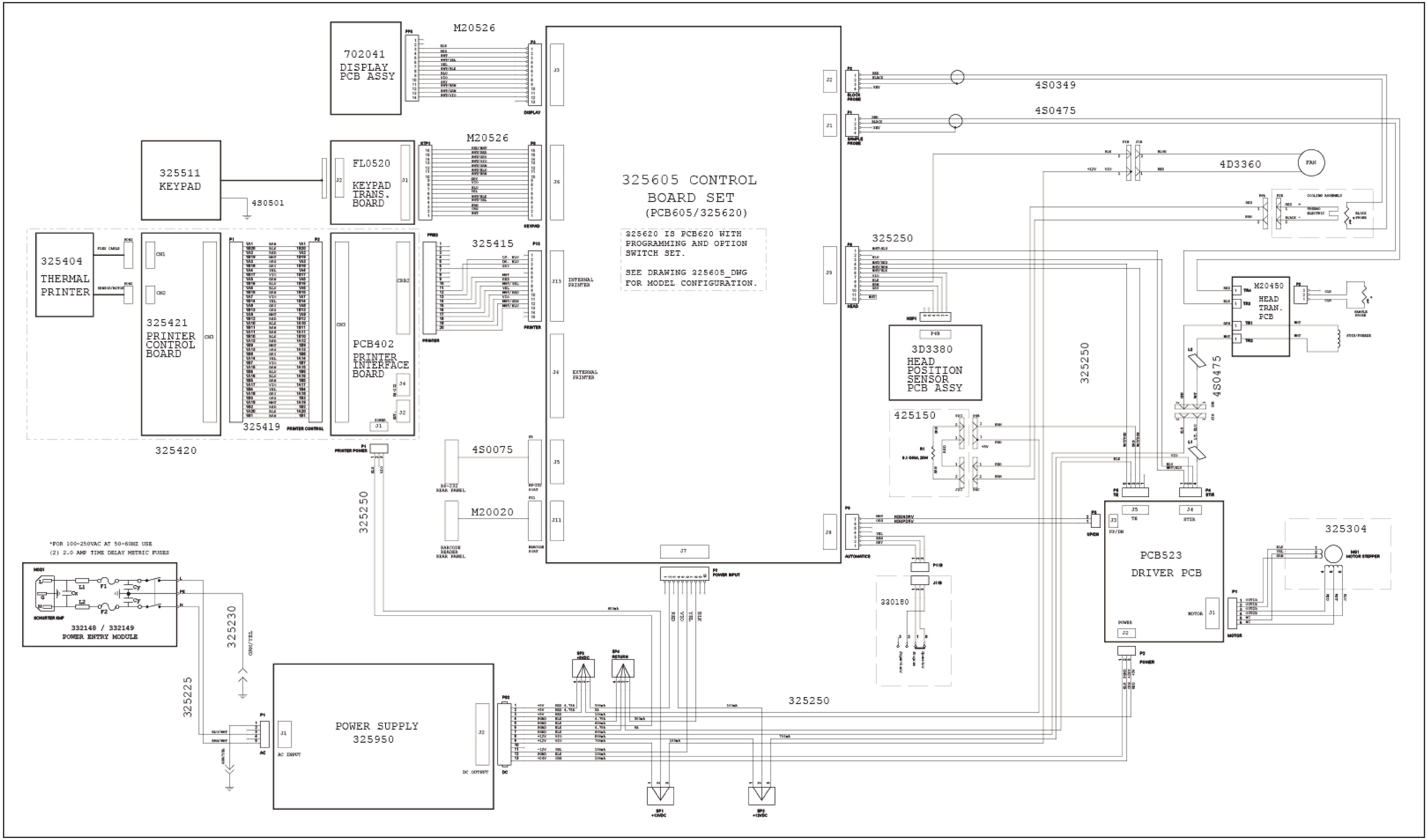
325000 Interconnection Schematic Rev7
for Serial Suffix D


702041
DISPLAY PCB ASSY
M20526
DISPLAY
325511
KEYPAD
4S0501
FL0520
KEYPAD TRANS. BOARD
M20526
KEYPAD
325404
THERMAL PRINTER
FLEX CABLE
325421
PRINTER CONTROL BOARD
CN1
CN2
CN3
325419
PRINTER CONTROL
PCB402
PRINTER INTERFACE BOARD
325415
PRINTER
325420
PRINTER POWER
325605 CONTROL BOARD SET
(PCB605/325620)
325620 IS PCB620 WITH PROGRAMMING AND OPTION SWITCH SET.
SEE DRAWING 325605_DWG FOR MODEL CONFIGURATION.
INTERNAL PRINTER
EXTERNAL PRINTER
4S0075
RS-232 REAR PANEL
M20020
BARCODE READER REAR PANEL
POWER INPUT
4S0349
BLOCK PROBE
4S0475
SAMPLE PROBE
4D3360
FAN
COOLING ASSEMBLY
THERMO ELECTRIC
BLOCK PROBE
325250
HEAD
3D3380
HEAD POSITION SENSOR PCB ASSY
425150
M20450
HEAD TRAN. PCB
SAMPLE PROBE
STIR/FREEZE
325250
4S0475
AUTOMATICS
330180
PCB523
DRIVER PCB
UP/DN
TE
STIR
MOTOR
POWER
325304
MOTOR STEPPER
*FOR 100-250VAC AT 50-60HZ USE
(2) 2.0 AMP TIME DELAY METRIC FUSES
SCHURTER KMF
332148 / 332149
POWER ENTRY MODULE
325230
GRN/YEL
325225
AC
POWER SUPPLY
325950
AC INPUT
DC OUTPUT
DC
325250
SP1 +12VDC
SP2 +12VDC
SP3 +5VDC
SP4 RETURN

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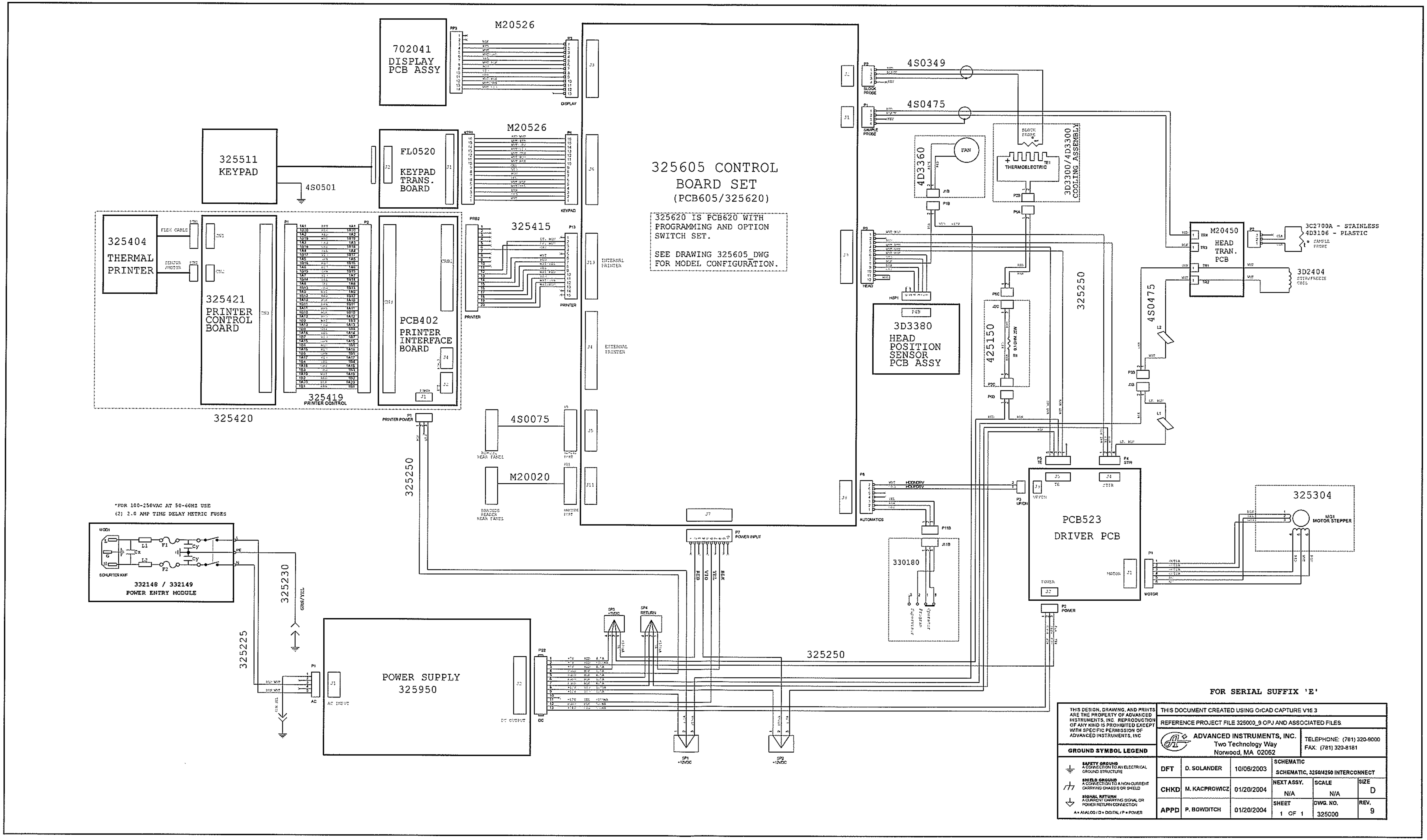
325000 Interconnection Schematic Rev8
for Serial Suffix D


702041
DISPLAY PCB ASSY
M20526
325511
KEYPAD
4S0501
FL0520
KEYPAD TRANS. BOARD
M20526
325605 CONTROL BOARD SET
(PCB605/325620)
325620 IS PCB620 WITH PROGRAMMING AND OPTION SWITCH SET.
SEE DRAWING 325605_DWG FOR MODEL CONFIGURATION.
325404
THERMAL PRINTER
325421
PRINTER CONTROL BOARD
325419
PRINTER CONTROL
PCB402
PRINTER INTERFACE BOARD
325415
325420
4S0075
M20020
INTERNAL PRINTER
EXTERNAL PRINTER
DISPLAY
KEYPAD
PRINTER
4S0349
4S0475
BLOCK PROBE
SAMPLE PROBE
4D3360
FAN
THERMOELECTRIC
3D3300/4D3300 COOLING ASSEMBLY
M20450
HEAD TRAN. PCB
3C2700A - STAINLESS
4D3106 - PLASTIC
3D2404
STIR/FREEZE COIL
3D3380
HEAD POSITION SENSOR PCB ASSY
425150
325250
4S0475
PCB523
DRIVER PCB
325304
MOTOR STEPPER
330180
AUTOMATICS
POWER INPUT
325250
*FOR 100-250VAC AT 50-60HZ USE
(2) 2.0 AMP TIME DELAY METRIC FUSES
SCHURTER KMF
332148 / 332149
POWER ENTRY MODULE
325230
GRN/YEL
325225
POWER SUPPLY
325950
AC INPUT
DC OUTPUT
325250
RED
VIO
YEL
BLK
+5VDC
RETURN
+12VDC
+12VDC

FOR SERIAL SUFFIX 'E'

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GROUND SYMBOL LEGEND	ADVANCED INSTRUMENTS, INC. Two Technology Way Norwood, MA 02062			TELEPHONE: (781) 320-9000 FAX: (781) 320-8181	
⏚ SAFETY GROUND A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE	DFT	D. SOLANDER	10/06/2003	SCHEMATIC SCHEMATIC, 3250/4250 INTERCONNECT	
SHIELD GROUND A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD	CHKD	M. KACPROWICZ	01/20/2004	NEXT ASSY. N/A	SCALE N/A	SIZE D
SIGNAL RETURN A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION A = ANALOG / D = DIGITAL / P = POWER	APPD	P. BOWDITCH	01/20/2004	SHEET 1 OF 1	DWG. NO. 325000	REV. 9

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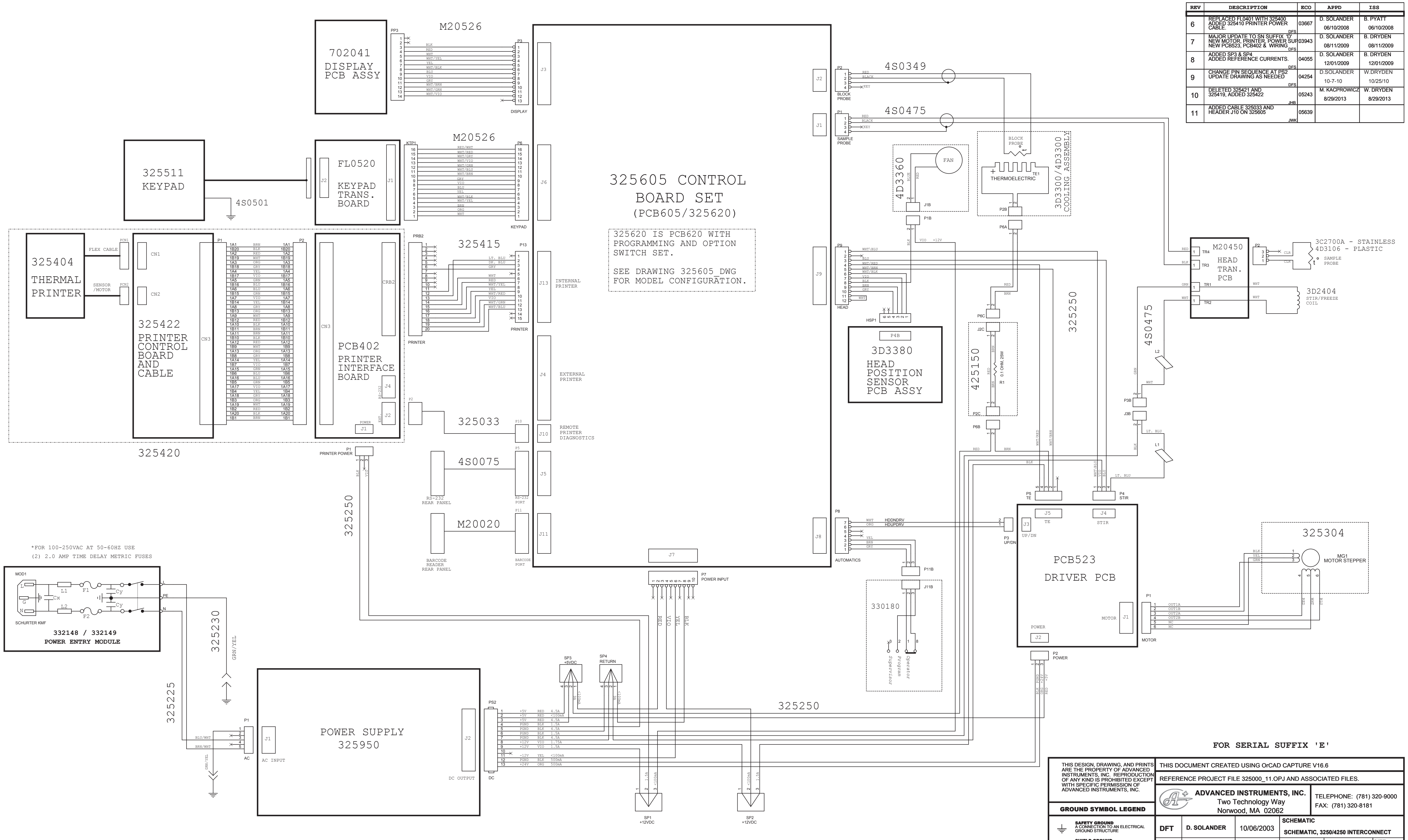
325000 Interconnection Schematic Rev9
for Serial Suffix E

REV	DESCRIPTION	ECO	APPD	ISS
6	REPLACED FL0401 WITH 325400 ADDED 325410 PRINTER POWER CABLE. DFS	03667	D. SOLANDER 06/10/2008	B. PYATT 06/10/2008
7	MAJOR UPDATE TO SN SUFFIX 'D' NEW MOTOR, PRINTER, POWER SUP NEW PCB523, PCB402 & WIRING DFS	03943	D. SOLANDER 08/11/2009	B. DRYDEN 08/11/2009
8	ADDED SP3 & SP4 ADDED REFERENCE CURRENTS. DFS	04055	D. SOLANDER 12/01/2009	B. DRYDEN 12/01/2009
9	CHANGE PIN SEQUENCE AT PS2 UPDATE DRAWING AS NEEDED DFS	04254	D.SOLANDER 10-7-10	W.DRYDEN 10/25/10
10	DELETED 325421 AND 325419, ADDED 325422 JHB	05243	M. KACPROWICZ 8/29/2013	W. DRYDEN 8/29/2013
11	ADDED CABLE 325033 AND HEADER J10 ON 325605 JWK	05639		


702041
DISPLAY PCB ASSY
M20526
PP3
P3
DISPLAY
J3
325511 KEYPAD
4S0501
FL0520 KEYPAD TRANS. BOARD
J2
J1
M20526
KTP1
P6
KEYPAD
J6
325404 THERMAL PRINTER
FLEX CABLE
SENSOR /MOTOR
PCN1
PCN2
CN1
CN2
CN3
325422 PRINTER CONTROL BOARD AND CABLE
P1
P2
PCB402 PRINTER INTERFACE BOARD
CRB2
PRB2
J4
J2
J1
POWER
325420
325415
P13
PRINTER
J13
INTERNAL PRINTER
J4
EXTERNAL PRINTER
325033
P10
J10
REMOTE PRINTER DIAGNOSTICS
P1
PRINTER POWER
4S0075
RS-232 REAR PANEL
P5
J5
RS-232 PORT
M20020
P11
J11
BARCODE READER REAR PANEL
BARCODE PORT
325605 CONTROL BOARD SET
(PCB605/325620)
325620 IS PCB620 WITH PROGRAMMING AND OPTION SWITCH SET.
SEE DRAWING 325605_DWG FOR MODEL CONFIGURATION.
J7
P7
POWER INPUT
J2
J1
J9
J8
4S0349
P2
BLOCK PROBE
4S0475
P1
SAMPLE PROBE
4D3360
FAN
J1B
P1B
BLOCK PROBE
THERMOELECTRIC
TE1
3D3300/4D3300 COOLING ASSEMBLY
P2B
P6A
P9
HEAD
HSP1
P4B
3D3380 HEAD POSITION SENSOR PCB ASSY
P6C
J2C
425150
0.1 OHM, 25W
R1
P2C
P6B
325250
M20450 HEAD TRAN. PCB
TR4
TR3
TR1
TR2
3C2700A - STAINLESS
4D3106 - PLASTIC
SAMPLE PROBE
3D2404 STIR/FREEZE COIL
4S0475
L2
P3B
J3B
L1
P5 TE
P4 STIR
P8
AUTOMATICS
HDDNDRV
HDUPDRV
P3 UP/DN
J3
J5 TE
J4 STIR
PCB523 DRIVER PCB
POWER
J2
P2 POWER
MOTOR J1
P1
MOTOR
OUT1A
OUT1B
OUT2A
OUT2B
NC
325304
MG1 MOTOR STEPPER
P11B
J11B
330180
Operator
Program
Supervisor
325250
*FOR 100-250VAC AT 50-60HZ USE
(2) 2.0 AMP TIME DELAY METRIC FUSES
MOD1
L1
L2
F1
F2
Cx
Cy
SCHURTER KMF
332148 / 332149
POWER ENTRY MODULE
325230
GRN/YEL
325225
BLU/WHT
BRN/WHT
P1
AC
J1
AC INPUT
POWER SUPPLY 325950
J2
DC OUTPUT
PS2
DC
SP3 +5VDC
SP4 RETURN
325250
SP1 +12VDC
SP2 +12VDC

FOR SERIAL SUFFIX 'E'

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SAFETY GROUND A CONNECTION TO AN ELECTRICAL GROUND STRUCTURE	DFT	D. SOLANDER	10/06/2003	SCHEMATIC SCHEMATIC, 3250/4250 INTERCONNECT	
SHIELD GROUND A CONNECTION TO A NON-CURRENT CARRYING CHASSIS OR SHIELD	CHKD	M. KACPROWICZ	01/20/2004	NEXT ASSY. N/A	SCALE N/A	SIZE D
SIGNAL RETURN A CURRENT CARRYING SIGNAL OR POWER RETURN CONNECTION A = ANALOG / D = DIGITAL / P = POWER	APPD	P. BOWDITCH	01/20/2004	SHEET 1 OF 1	DWG. NO. 325000	REV. 11

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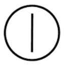
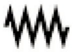
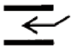
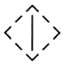
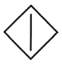
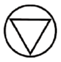
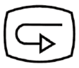
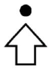
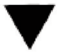
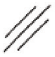
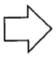
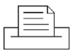
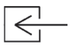
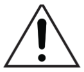
325000 Interconnection Schematic Rev11
for Serial Suffix E

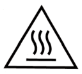
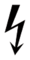
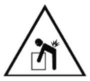
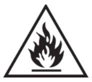
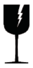
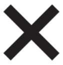
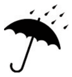
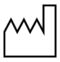
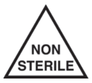
Appendix A

Symbol Definitions

Symbol Definitions

The following symbols may appear in product literature, or on intruments or product packaging.

	On-Off
	Feed
	Interrupt
	Test
	Start
	Stop
	Record Review
	Setup
	Calibration
	Cancel; Delete
	Functional Arrow
	Printer
	Enter
IOIOI	RS232
	Bar Code
	Attention

	Caution Hot Surface
	Dangerous Voltage
	Lifting Hazard
CAL	Calibrator
CONT	Content
CONTROL	Control
CONTROL –	Negative Control
CONTROL +	Positive Control
	Flammable
	Fragile
	Irritant
	Keep Dry
	Date Manufactured
STERILE	Sterile
	Non-Sterile
SN	Serial Number

SOLN	Solution
⊘	Do Not Open Top
HANDLE WITH CARE	Handle With Care
☠	Toxic
USE BLADE TO OPEN	Use Blade To Open
⊘	Do Not Re-Use
IVD	For *In Vitro* Diagnostic Use
CE	European Conformity
🌡	Temperature Limit
i	See Instructions
LOT	Lot Number
🏭	Manufacturer

⌛	Use By; Expiration Date
EC REP	Authorized Representative
REF	Part Number
Σ x	Sufficient for [x] Tests
	Open Here
	Low Fluid Level
🚫	Keep Hands Clear
LATEX	Latex-Free
SAMP DIL	Diluent
i	See Instructions for Temperature Guidelines
⚠	Potential Puncture Hazard
	Electronic Equipment - Dispose of Properly

Appendix B
Product Disposal and Recycling

Product Disposal and Recycling

International concern about environmental pollution resulting from improper disposal of products and materials at the end of their useful life has resulted in an increase in legislation to control the methods and procedures used to handle waste electrical and electronic equipment. While the regulatory status in some regions of the world has progressed to the point where formal legislation is already in effect, many other regions are in the process of creating similar legislation or adopting that already in existence in other areas. The result in the years ahead will be more stringent control over disposal of products and recycling of their components once they are withdrawn from use.

Since regulations governing the disposal of your instrument and accessories may vary depending upon your geographic location, the following guidelines are provided to assist you in identifying the options available to you once the decision has been made to replace or dispose of this product:

- Contact the supplier who sold you the product. Whether this was Advanced Instruments itself, or one of its authorized dealers, this supplier should be knowledgeable about the national and local regulations governing disposal and recycling of products in your area. In some cases, this supplier may be legally obligated to accept the product from you and arrange for proper disposal or recycling with no further involvement on your part. Alternately, the supplier can provide you with specific instructions for actions that you can take to dispose of the product properly.

- Contact your local government agency responsible for waste collection and disposal. They can identify procedures and restrictions in effect to ensure proper disposal, and available locations where products can be sent.

- Contact Advanced Instruments Hot-Line Service:
  - 800 225-4034 (toll-free within the USA and Canada; after normal business hours, dial extension 2191)
  - +US 781-320-9000 (elsewhere)
  - 781-320-0811 (fax)

  Service personnel will provide you with contact information for local disposal, or instructions for returning the product directly to Advanced Instruments.

Notes:

Appendix C
Service Log

Service Log

To call for Service:	(781) 320-9000 or (800) 225-4034; after normal business hours, dial extension 2191
FAX	(781) 320-0811

Model Number____________________ **Serial Number**____________________

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Symptoms or Problems	Repairs, Replacements or Changes	Serviced by

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